Department of Computer Science

Coopetitive Service Innovation in Mobile Payment Ecosystems

Junying Zhong

Aalto University

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Coopetitive Service Innovation in Mobile Payment Ecosystems

Junying Zhong

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Abstract

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Abstract

Mobile payments are a new way to pay in the digital era. The emerging mobile payment platforms and services enable viable businesses through exchanges of value between consumers and collaborating actors in a real-time and context-specific way. However, business interactions in mobile payment markets are reflected in a highly dynamic market structure that requires coopetition (simultaneous competition and collaboration) between the participants in the markets.

This dissertation studies how mobile payment solutions are innovated in business networks. The focus is on the coopetitive service innovation in mobile payment ecosystems. The first investigation is a comparison of mobile payment service innovation in the Finnish and Chinese markets. This investigation shows that the interindustry cooperation happens in both markets to facilitate the effective realization of mobile payment solutions. The findings show differences in the providers' strategic positions. An empirical study on consumer adoption emphasizes the importance of interfirm collaboration in the mobile payment supply chain. The following case studies address Bestpay, Alipay, UnionPay, Elisa Wallet, and Apple Pay.

These studies result in three theoretical models for managing firms' coopetition in a digital business ecosystem. The RISE model (Resources — Inter-/Self-organizational innovation — Ecosystem) can be used to identify the win-win relationships in interfirm co-innovation. The DISCO model (Dynamics of Innovation Strategy in Coopetitive Environment) helps a company to adjust its strategic positioning in a coopetitive environment. The COIN model (Coopetitive Innovation) introduces the Consumer Matrix, the Business Matrix, and the Resource Matrix. These help companies to recognize their resource advantages: superior vs. inferior, and heterogeneous vs. homogeneous. In addition to the theoretical contribution, the models help firms to identify and define their business relations in service innovation ecosystems.

Overall, this dissertation contributes to the understanding of mobile payment service innovations in digital ecosystems for managing coopetition.

Keywords Mobile payment, Coopetition, Innovation, Strategy, Business ecosystem

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Preface

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Helsinki, September 8, 2015,

Junying Zhong

Contents

List of Publications

This thesis consists of an overview and of the following publications which are referred to in the text by their Roman numerals.

I Junying Zhong. A comparison of mobile payment procedures in Finnish and Chinese markets. In *Proceedings: Twenty Second Bled eConference eEnablement: Facilitating an Open, Effective and Representative eSociety*, Bled, Slovenia, pp:79-96, June 2009.

II Junying Zhong, Amandeep Dhir, Marko Nieminen, Matti Hämäläinen, and Juha Laine. Exploring Consumer Adoption of Mobile Payments in China. In *Proceedings: ACM International Conference on Making Sense of Converging Media (Academic MindTrek'13)*, Tampere, Finland, pp:318-325, October 2013.

III Junying Zhong, and Marko Nieminen. Resource-based Co-innovation through Platform Ecosystem: Experiences on Mobile Payment Innovation in China. *Journal of Strategy and Management,8(3), pp:283-298*, ISSN 1755-425X, Emerald Group Publishing Limited 2015.

IV Junying Zhong, and Marko Nieminen. Platform as a Strategy: Collective Innovation in Mobile Payment Ecosystem. *To appear in International Journal of E-services and Mobile Application*, IGI Global Publishing, 2015.

V Junying Zhong, and Marko Nieminen. Coopetitive Innovation Strategy Analysis in Digital Ecosystems: Case Mobile Payment. In *Submitted*, 2015.

Author's Contribution

Publication I: "A comparison of mobile payment procedures in Finnish and Chinese markets"

The author of this dissertation was an independent author of this article. The author of this dissertation conducted the data collection, analysis, and results reporting of the mobile payment comparison between the Finnish and Chinese markets.

Publication II: "Exploring Consumer Adoption of Mobile Payments in China"

The author of this dissertation was the primary author of this article. The primary author and the third author proposed the original idea for studying mobile payment adoption by consumers. The primary author and the secondary author designed and carried out the data collection. The primary author conducted the data analysis and reporting alongside the other authors.

Publication III: "Resource-based Co-innovation through Platform Ecosystem: Experiences on Mobile Payment Innovation in China"

The author of this dissertation was the primary author of this article. She devised the original idea and the problem settings for studying the providers' strategies in mobile payment service innovations. She designed the research, collected the data, and conducted the data analysis. She wrote the manuscript with the second author.

Publication IV: "Platform as a Strategy: Collective Innovation in Mobile Payment Ecosystem"

The author of this dissertation was the primary author of this article. She conducted the problem settings and research design for in-depth studying of innovators' strategic moves in the field of mobile payment platforms and services. She designed and carried out the data collection and analysis of the study. The primary author and the secondary author participated in joint discussions of the content, model, and structure of the publication.

Publication V: "Coopetitive Innovation Strategy Analysis in Digital Ecosystems: Case Mobile Payment"

The author of this dissertation was the primary author of this article. She designed the research of constructing a coopetitive innovation strategy analysis model for analyzing digital ecosystems. She conducted the development of the COIN model and the related analysis matrixes. The primary author and the secondary author carried out the collection of the cases and participated in joint discussions of the content and structure of the publication.

List of Abbreviations

API	Application Programming Interface
B2C	Business-to-Consumer
CFA	Confirmatory Factor Analysis
CNNIC	China Internet Network Information Center
COIN	Coopetitive Innovation
DISCO	Dynamics of Innovation Strategy in Coopetitive Environment
E-	Electronic-
EPC	European Payment Council
EU	European Union
ICT	Information and Communication Technology
IDT	Innovation Diffusion Theory
IoT	Internet of Things
IT	Information Technology
M-	Mobile-
NFC	Near Field Communication
O2O	Online to Offline
PBC	People's Bank of China
POS	Point-of-Sale
PSD	Directive on Payment Services

QR	Quick Response Code
RFID	Radio-Frequency Identification
RISE	Resources — Inter-/Self-organizational innovation — Ecosystem
SD	Strategic Domain
SEM	Structural Equation Modeling
SMS	Short Message Service
SNS	Social Networking Service
SVW	Social Virtual World
TAM	Technology Acceptance Model
Telcos	Telecom Service Providers
TRA	Theory of Reasoned Action
UI	User Interface
UTAUT	Unified Theory of Acceptance and Use of Technology
UX	User Experience
WAP	Wireless Application Protocol

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1. Introduction

In the digital era, mobile payments appear to be a new way to pay in business networks. Over the past two decades, the advancement of payment innovations has been recognized by academics and practitioners (Berger et al., 1996; Milne, 2006; Szmigin and Foxall, 1998). The emerging mobile payment innovative services enable a real-time exchange of value between consumers and collaborating actors in business networks and digital ecosystems (Corallo et al., 2007; Feijóo et al., 2009; Gaur et al., 2013; Moore, 1993, 1996).

1.1 Background and motivation

Mobile payment ecosystems (Contini et al., 2011; Gaur and Ondrus, 2012; Kendall et al., 2011; Zhong et al., 2011) involve interdependent relationships and interactions among multiple stakeholders. The business interactions in mobile payment ecosystems are reflected in a highly dynamic market structure that brings coopetition (simultaneous competition and collaboration) (Bengtsson and Kock, 2000; Gnyawali and Park, 2011) between the stakeholders in the markets. It has become one of the unsolved issues in mobile payment ecosystems, as well as in digital ecosystems, while multiple stakeholders participate in service innovations. The aim of this dissertation is to study how to manage coopetition in mobile payment service innovation.

1.1.1 Conceptual groundings of mobile payment

A mobile payment was mainly defined as a payment for goods, services, and bills with a mobile device, by using a mobile instrument, or by taking advantage of a mobile technology (Au and Kauffman, 2008; Dahlberg, 2015; Dahlberg et al., 2008b; de Reuver et al., 2014; Dewan and Chen,

2005; Karnouskos, 2004). These definitions identify a mobile payment from the perspective of technology or the technology-enabled devices. The definitions attempt to describe the general characteristics of a mobile payment from a technological aspect. A few researchers have described mobile payments with morphology frameworks of differentiated characteristics (e.g., strategic, participants, and operational) to classify and distinguish different mobile payments from each other (Kreyer et al., 2002a, 2003; Pousttchi, 2003; Zhong, 2009; Zwicky, 1966). In addition to the technological aspect, the morphology frameworks attempt to describe mobile payments in a broad and underlying way. These descriptions of mobile payment point out a direction to explain why and how mobile payment appears heterogeneously in innovative services, businesses, and platform ecosystems.

This dissertation defines mobile payments concerning both "payment" and "mobile." The author of this dissertation considers mobile technology or technology itself as a means to achieve "exchanges of value" (Ferguson, 2008; McKinnon, 1963) — "payment" (European Commission, 2007; OMahony et al., 1997). The means to implement "payment" can vary in technology and technology-enabled carriers — "devices" or "instruments." Importantly, the fundamental need of "mobile" is recognized as the nature of "mobile payment" that is different from another "payment." The reason that "mobile" is needed in the process of payment, presents another way to define a "mobile payment." A "payment" service is mainly stimulated by a business with a requirement of an "exchange of value." A "mobile" service is normally needed in a situation or a business scenario with a requirement of "mobile" (Cho et al., 2011; Haythornthwaite, 1996; Milojičić et al., 1999; Wang et al., 2011; Wasserman and Faust, 1994) — not being restricted by time and space. Thus, mobile payments are a "mobile" way to pay and implement an "exchange of value". Additionally, a mobile payment service is usually evoked by a business scenario with a requirement of a "mobile" way implementing an "exchange of value."

The emerging mobile payment platforms and services enable viable businesses through exchanges of value between consumers and collaborating actors in a real-time and context-specific way (Zhong and Nieminen, 2015). These "viable businesses" are taking (or will take) place in an unprecedented wide range of business scenarios. These business scenarios can break through the restriction of time and space, achieving ubiquitous, including both online and offline purchasing, both social and business ac-

tivities, as well as both virtual and real economy. That is to say, involving "mobile" in a "payment" is an effective way to meet the requirements in those emerging "viable businesses" for an "exchange of financial value" "in a real-time and context-specific way." Normally, a "mobile" payment solution will be preferred in the situations triggered by a specific business with a requirement of "mobile" solution of "payment." Therefore, the "viable businesses" are essential for the successes of mobile payment platforms and services.

Implementing an "exchange of value" usually involves a process of money flow through exchange of "financial account information" (Organisation for Economic Co-operation and Development (OECD), 2014). Since money is generally recognized as a store of value and a medium of exchange (Ferguson, 2008; McKinnon, 1963), the role of banks, which are lawful money (currency) issuers, is extremely difficult to be replaced or bypassed in a payment process. Especially, the role of banks is irreplaceable in a payment service while "financial account information" is owned by the lawful monopoly of banks, and an exchange of "financial account information" is required in a payment process.

The role of traditional banks has been challenged by new entrants to the payment realm, especially in "mobile" solutions to carry out an "exchange of value" (Allen et al., 2002; Hughes and Lonie, 2007; White, 1998). Numerous innovative payment services (e.g., mobile wallets) lead to accelerated decline of the traditional monopoly of banks in the supply of transactions balances (Edwards and Mishkin, 1995; Ertürk and Özgür, 2014; Llewellyn, 1996). New entrants, either a non-bank financial intermediary (Bond, 2004) or a non-financial intermediary (Allen and Santomero, 1997), provide their innovative payment services to consumers and merchants directly. It raises questions about the importance of having an exchange of "financial account information" in their payment processes and about the traditional monopoly of banks regarding the "financial account information."

In many service processes of emerging mobile payment solutions initiated by a non-bank intermediary, e.g., third-party mobile payment solutions for purchasing goods, banks play a role of "upstream firms" in the "banks — third parties — consumers and merchants" chain (see Figure 5.4) in a "vertical collaboration" relationships (Nieto and Santamaría, 2010; Prakash and Deshmukh, 2010; Renko, 2011) . In these "vertical collaboration" relationship, banks still are the supply of "financial account

information" (e.g., acquiring and issuing bank account information), but indirectly — "one step" away from consumers and merchants via third parties as an intermediary. Banks take a strong role of indirect supplier of "financial account information" in these emerging account-based mobile payment solutions. However, these emerging mobile payment solutions compete with the traditional payment solutions supported by banks and the emerging solutions initiated by intermediaries. Traditional payment instruments and services (e.g., cash and credit/debit card) are widespread provided by banks in numerous business scenarios. Some emerging mobile payment solutions (e.g., MasterCard established the acceptance of contactless payments as a standard in Europe in September 2014, and Germany's Hamburger Volksbank offers mobile NFC payments (European Payments Council (EPC), 2014)) are initiated and provided by banks and non-bank financial intermediaries to consumers directly. Therefore, both collaboration and competition appear in the vertical relation between banks and non-bank intermediaries.

Moreover, the mobile payment service providers (i.e., banks and non-bank intermediaries) compete with each other usually when their payment services are provided and available to consumers in the same the business scenarios, because the money flow cannot be occupied by two technological payment systems at the same time. That is to say, these mobile payment service providers usually appear as competitors in a "horizontal relation" from the perspective of consumer-driven services. In particular, they have the same target consumer groups. Normally, the horizontal competition takes place among the competitors who provide business offerings in overlapping markets. However, the horizontal collaboration between these competitors (Bengtsson and Kock, 2000) also has the potential to take place in the future while their mobile payment services are the same in consumer groups but vary in business offerings (i.e., scenarios), similar to the share-coding services of airlines among competitors who provide business offerings in nonoverlapping markets (Netessine and Shumsky, 2005) and buying groups (Chen et al., 2015; Lin and Wu, 2015; Ni et al., 2015; Spekman and Stern, 1979). Therefore, both collaboration and competition can take place in the horizontal relation among competing intermediaries.

Many emerging services are increasingly being innovated in close collaboration between different organizations in digital platform ecosystems. Notably, competing firms have started collaborating with each other as

part of these emerging service innovations (Ritala et al., 2009). This dissertation considers these complex situations (e.g., vertical competition, vertical collaboration, horizontal competition, horizontal collaboration) as coopetition (Bengtsson and Kock, 1999, 2000, 2014; Gnyawali and Park, 2011; Lacoste, 2012) of mobile payment markets where businesses pursue competition and collaboration simultaneously (see Publication III, Publication IV, and Publication V).

Usually, mobile payment services are provided by mobile payment platforms that play a central role, acting as a bridge in mobile payment ecosystems. The platform is recognized as a strategy and a new way to organize superior heterogeneous resources, within and without platform-dominant ecosystems, for co-innovating mobile payment services (Zhong and Nieminen, 2015). Mobile payment ecosystems, similar to other digital business ecosystems, are defined in this dissertation as the functional communities of relevant organisms, along with their resources and capabilities, gathered around mobile payment solutions that are joined with the environments. These ecosystems consist of interactive and interdependent relationships between independent actors. The actors include the direct contributors and indirect contributors. The direct contributors consist of the service providers (i.e., mobile operators, financial institutions, and integration partners) and the direct suppliers (i.e., content supporters, device manufacturers, and distributors). The indirect contributors involve the competitors, the end-users (i.e., consumers and merchants), the indirect suppliers (i.e., special software and hardware developers), and the environmental entities (i.e., regulatory institutions, related industrial companies, and other stakeholders).

The major interconnections of the actors in mobile payment ecosystems are concerned in this dissertation as follows: the standards of the applied technologies, the strategies adopted by the service providers and other participants, the models of businesses that make use of mobile payments, the behavioral characteristics of the users, the interactions between entities, and the laws and regulations that govern the capital (money) flows and processes of mobile payments.

Mobile payment platform ecosystems are essential components of digital business ecosystems (Corallo et al., 2007; Feijóo et al., 2009; Gaur et al., 2013). Mobile payment ecosystems, similar to other digital business ecosystems (Moore, 1993, 1996), involve interdependent relationships and interactions between actors. The business interactions in mobile payment

ecosystems are reflected in a highly dynamic market structure that requires simultaneous competition and collaboration; namely, coopetition between the actors in the markets (Bengtsson and Kock, 2000; Gnyawali and Park, 2011; Zhong and Nieminen, 2015). It has become one of the unsolved issues in mobile payment ecosystems, as well as in digital business ecosystems, while actors participate in the sustainable development of service innovations.

During the past two decades, increasing resource-based co-innovation through platform ecosystem has appeared for co-creation of value (Ceccagnoli et al., 2012; Grant, 1991; Zhong and Nieminen, 2015). Economists have formed two main categories of innovation: product and process (Dosi et al., 1988; Greenhalgh and Rogers, 2010; Howells, 2001). The basis of such innovations has been highlighted and recognized by scholars as a variety of new knowledge (Fischer, 2001; Greenhalgh and Rogers, 2010). Coopetition for innovation, both technological (Ritter and Gemünden, 2004) and services (Howells, 2001) has been gradually considered as a key role for firms achieving competitive advantage (Barney, 1991; Grant, 1991; Porter and Millar, 1985), and cooperative advantage (Cooke et al., 2002; Dyer and Singh, 1998; Lei et al., 1997) since the 1990s (Dagnino and Padula, 2002; Gilson et al., 2009; Gnyawali and Park, 2011; Helmers and Rogers, 2010; Nieto and Santamaría, 2010; Polder et al., 2010).

1.1.2 The evolution of the payment innovation paradigm

The development of information and communication technologies (ICT) drives both radical and incremental innovations in payments (Bouwman et al., 2008). The payment innovations can be broken down into the following three aspects: payment intermediaries (Au and Kauffman, 2008; Bradford et al., 2003), payment instruments (Snellman et al., 2001; Stavins, 2002), and payment services (Neuman and Medvinsky, 1995; Schierz et al., 2010).

Firstly, the payment service provider acts as an intermediary in business ecosystems. The traditional payment intermediaries are financial institutions such as banks, credit card issuers (e.g., Chase and Citi), and the payment processing networks (e.g., MasterCard and Visa). These years, a number of new and licensed companies are participating in the payments sector, which is a traditional financial realm. The licensed companies are mainly established by non-financial institutions such as a trusted third-party (e.g., PayPal and Alipay), a Telecom (e.g., Safaricom and NTT

DoCoMo), an Internet giant (e.g., Google and Tencent), or a handset manufacturer (e.g., Apple and Samsung).

Payment innovations have blurred the boundaries between financial institutions and non-financial institutions (Lin et al., 2001). Additionally, payment innovations could be driven by the coopetition(simultaneous pursuit of collaboration and competition) in business networks (Bengtsson and Kock, 2000). The coopetitive business networks for payment innovations encompass financial and non-financial criteria (Gonggrijp et al., 2013). Therefore, managing simultaneous competition and collaboration creates serious challenges to both traditional financial institutions and the new licensed enterprises while starting a payment business in their business networks. On the one hand, traditional financial institutions are increasingly facing competition from a wider range of actual and potential providers of payment services. On the other hand, traditional financial institutions pursue collaboration with these non-financial providers for the coevolution of payment services and vice versa. As a result, the coopetition among participating actors has profoundly changed the financial and economic systems over the past few years.

Secondly, great progress on payment instruments has been made in the last two decades (Hancock and Humphrey, 1997). Many new payment instruments, such as digital payment instruments, have been initiated, realized, and commercialized. This dissertation considers the progress of payment instruments to be several stages, including barter stage, metal currency stage, physical currency stage (e.g., coin, banknote, and credit card), and digital currency stage (e.g., PayPal, Alipay, and Bitcoin). Digital currency is a digital representation of value. It consists of centralized virtual currency, which has a centralized repository and a central administrator (e.g., PayPal and Alipay), and de-centralized virtual currency, namely cryptocurrency (e.g., Bitcoin and Litecoin). Centralized virtual currency is issued and controlled by its developers. It is usually used and accepted in a specific virtual community (ECB, 2012). Cryptocurrency is a type of digital, de-centralized, and open-source currency. It often uses cryptography, e.g., digital signatures, to identify an individual (FinCEN, 2013).

The traditional payment intermediaries have issued and controlled physical currency as the traditional payment instruments for a long time. In recent years, many payment intermediaries have launched a number of new payment instruments to be one of the supplementaries or alter-

natives for traditional payment instruments. For example, e-payment (electronic payment) instruments enable efficient electronic transactions and promote e-commerce (electronic commerce). In addition, innovative mobile payment instruments enable mobility of transactions and break through the boundaries of online and offline merchandising. Mobile payment instruments make it possible for consumers to implement transactions through a "software" application (e.g., mobile wallets) rather than a "hardware" material (e.g., banknote, coin, and credit card).

Thirdly, another important aspect of payment innovations refers to payment services. Over the last few years, some innovative payment services went beyond the sphere of traditional payment service concepts and activities, especially in the mobile payment services domain. Many payment-related issues should be regulated and addressed by government regulation as well as self-regulation by an involved industry. According to the EU's Directive on Payment Services (PSD 2007/64/EC) (European Commission, 2007), the key payment service activities that should be regulated are: cash deposits and withdrawals, execution of payment transactions, credit transfers, direct debits, payment card transactions, issuing payment instruments or acquiring payment transactions, money remittance, and payments sent through an intermediary, such as a Telecom, an IT system, or a network operator.

A variety of payment instruments were launched by banks and non-banks payment intermediaries. The aim of their involvements in service innovation may be to create new markets (Berry et al., 2006). More importantly, they have entered into payment innovation under increasing stress and pressure produced by intra-/interindustrial competitions. For example, traditional Telecom service providers (Telcos) are facing dramatically declining revenue from traditional voice services because social networking services (SNS) have become the primary communication media for a new generation of technically savvy and digitally aware consumers in recent years. Therefore, a number of Telcos and other non-financial institutions have entered the mobile payment domain, along with ICT progress and financial deregulation, which involve the barriers to entering the Internet finance domain.

The widespread adoption of mobile phones has led to the emergence of innovative mobile financial services (Duncombe and Boateng, 2009; Mallat et al., 2004; Tiwari et al., 2007). The emerging mobile services touch upon a variety of banking, financial, and payment solutions, namely mo-

bile banking, mobile micro-finance, mobile vouchers and loyalty cards, and mobile payment. The innovation of mobile payment instruments by mobile payment intermediaries has posed severe challenges to service innovation in the business networks. Self-organizational and interorganizational innovations on mobile payment services create both opportunities and challenges to different types of industries in their business networks. Especially, interorganizational service innovations are involved in launching new payment services (Ozcan and Santos, 2014).

Mobile payment has been a growing area of business with increasing intra-organizational and interorganizational service innovations. These service innovations are gradually but deeply changing the financial systems, the economic systems, and our daily lives. Numerous innovative mobile payment services have been launched to facilitate trading in both real world (e.g., traditional merchandising scenarios) and virtual world (e.g., Internet-based shopping (Liao and Cheung, 2001), Internet of things (IoT) (Gershenfeld et al., 2004), and social virtual world (SVW)) (Guo and Barnes, 2007; Mäntymäki and Salo, 2011a).

Moreover, in particular, a few trails of mobile payment are intended to transcend beyond the limits of a "hardware" material and a "software" application, such as "Kungfu" initiated by Alibaba's Alipay. "Kungfu" enables a consumer authorizing a definable material, such as a tattoo, pet, or physical movement, as an exclusive payment "entity". Therefore, it has a potential to be a unique but variable pointer that integrates a qualified payment "entity" in the real world, a quantified data portfolio, and a correlation matrix across the real world and virtual world. This is a trail and a progress indicator in the development of payment instruments and solutions. It means that the payment solutions are attempting to loosen the constraints of the strict dependence between the financial account and a steady "entity" such as a "hardware" material or a device installing a "software" application.

Furthermore, the previous regulations, such as EU's Directive on Payment Services (PSD 2007/64/EC), have been subjected to the challenges of the rapid development of mobile payment service innovations. Consequently, a European Commission's Green Paper (European Commission, 2011) was released in 2012, namely "Towards an integrated European market for card, internet and mobile payments." The Green Paper identified the main issues to concern regarding the innovations of payment, such as market access and entry, payment security and data protection,

transparent and efficient pricing of payment services, technical standardization, and interoperability between service providers. Similar concerns can be found in other government regulations on payment services, such as China's Electronic Payment Guidelines (People's Bank of China (PBC), 2005) and the Non-Financial Institution Payment Service Management Approach (People's Bank of China (PBC), 2010).

Along with the progress of the payment innovations on intermediaries, instruments, and services, mobile payment has long been discussed during the last two decades. Mobile payment is defined in this dissertation as a mobile way to achieving an exchange of financial value. In addition, this dissertation clarifies mobile payment service as another broad term that refers to a range of payment-related services that can be offered, wherein the mobile technologies are involved in core service offerings and/or supporting service offerings. In last two decades, numerous innovative mobile payment services and solutions have been introduced to both developing and developed economies. Many mobile payment applications have been launched by mobile network operators (e.g., Vodafone's M-pesa in Kenya, Osaifu-Keitai mobile wallet in Japan, China Telecom's Bestpay and Elisa's Elisa Lomppako in Finland). However, some of them last a short period of time, e.g., UK operator O2 announced to close down its O2 Wallet mobile commerce application in 2014, eighteen months after it launched. In addition, several previous online payment third-parties presented mobile payment solutions such as Alibaba's Alipay Wallet and PayPal Mobile. Also, numerous initiators, Internet giants (e.g., Google Wallet and Baidu Wallet), social networking service giants (e.g., Tencent WeChat Pay), mobile phone giants (e.g., Apple Pay and Samsung Pay), and merchant giants (e.g., Wal-Mart CurrentC), have been involved in innovating mobile payment solutions recently.

Currently, the emerging mobile payments are categorized as three criteria of solutions: proximity payment (e.g., offline purchases and authentications), remote payment (e.g., online escrow payments and transactions), and online-to-offline (O2O) payment (Hou and Wang, 2013; Slade et al., 2013; Yang, 2014). O2O payment is a typical innovative payment solution for O2O commerce. It allows a consumer to make payment via an online interface and then consume a good or service in an offline scenario.

Many initiator stakeholders have introduced and integrated contents and applications in terms of three criteria of mobile payment solutions as well as other mobile financial services, as mentioned above. More and

more initiators provide a mobile payment service as a combination of various solutions integrating the three criteria of solutions (e.g., China's Alipay Wallet and WeChat's in-app payment service). Also, the integrated service delivers a set of diverse mobile financial services such as mobile vouchers (e.g., WeChat's Food and Fun) and mobile micro-finance (e.g., Alipay Wallet's Yu'e Bao, an e-investment product).

Mobile payment has undergone numerous service innovations and continuous technological advancement. It is a wireless payment solution and mainly based on handset (e.g., escrow payment, quick response code (QR) payment) or contactless card (e.g., near field communication (NFC) and radio-frequency identification (RFID)) (de Reuver et al., 2014). Many witnesses show regional imbalances in the diffusion of mobile payment services as well as the acceptance of new mobile technologies.

On one hand, a few mobile payment services have been successfully implemented in highly developed economies, such as Japan's Mobile NFC Consortium (e.g., Osaifu-Keitai by NTT Docomo, KDDI and Softbank Mobile) (NFC World, 2014), as well as in emerging markets (Kshetri and Acharya, 2012), such as M-PESA in Kenya and Alipay Wallet in China. Safaricom's (a mobile network operator) M-PESA is a SMS-based mobile payment service for money transfer and micro-financing service in Kenya (Hughes and Lonie, 2007; Ngugi et al., 2010), which had 12.2 million active customers (more than half of the adult population) by October 2014 (CGAP, 2014). Alibaba's Alipay Wallet is a popular and integrated mobile wallet solution that makes use of several mobile technologies such as WEB/WAP (escrow) payment, sound wave payment, and quick response code (QR) payment. It recorded more than 6.9 billion transactions and accounted for roughly 50% of the total transactions of mobile payment in the second quarter of 2014 in China (iResearch, 2014).

On the other hand, numerous failed trials confirmed the difficulties of successfully initiating commercial implementations of mobile payment services on a large scale, especially in Western societies (Dahlberg et al., 2008a; Diniz et al., 2013; Gaur et al., 2013). From the end of the 1990s, many mobile payment solutions in Western societies have been initiated for specific purposes such as parking fees and vending machines. Recently, a few innovative mobile payment solutions have been launched for merchandising such as mobile vouchers and NFC payment in cafeterias. In addition, NFC-enabled cards have been delivered by current card issuers to realize wireless payment via point-of-sale (POS). Until now, card

(traditional debit/credit card) payment was considered the most attractive alternative over other payment instruments for consumers in most Western societies.

The research presented in this dissertation was motivated by the extensive success, failures, and unresolved issues taking place in the innovations of the mobile payment domain. The motivation question of the research is to look at why many stakeholders get involved in mobile payment innovations and what drives their success or failure while innovating in mobile payment services?

1.2 Research scope

The motivation question, as discussed in the last section, is general. In order to better understand those challenges and opportunities in mobile payment service innovations, the following scope has been set for this research (see Figure 1.1).

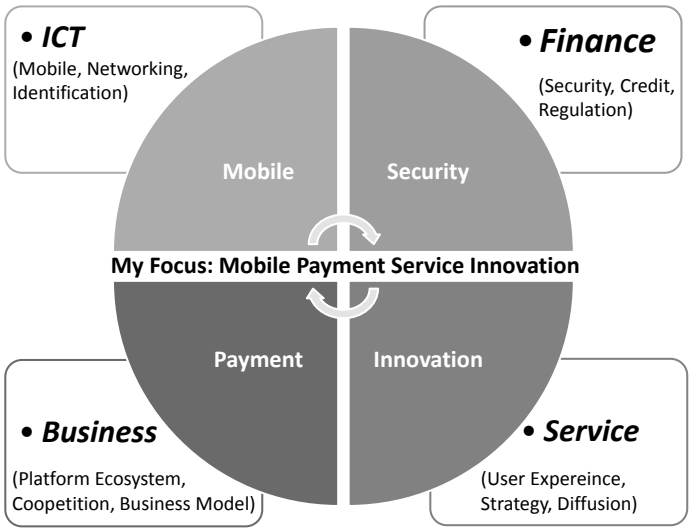

Figure 1.1. Research Scope and Focus

As shown in Figure 1.1, the research focuses on mobile payment service innovation, which is an intersection of the four aspects including business, ICT, finance, and service. In addition, the research concerns of the four aspects are listed in the figure: mobility in ICT developments (e.g., mobile, networking, and identification), security in finance (e.g., credit, security, and regulation), payment in business (e.g., platform ecosystem, coopeti-

tion, and business model), and innovation in service (e.g., user experience (UX), strategy, and diffusion).

1.3 Contributions

This dissertation summarizes five publications and addresses the overall research question (see Chapter 3). Publication I, Publication III, Publication IV, and Publication V deliver answers to the primary research question. Publication II, and Publication V provide answers to the secondary research question.

Publication I compares mobile payment procedures in the Finnish and Chinese markets through a cross-case study on mobile payment service innovations. According to the morphological method and from the strategic, participatory, and operational criteria perspectives, this publication reveals several crucial elements for the successful diffusion of mobile payments, including the existence of standardized, interconnected, and widely accepted mobile payment procedures. In addition, this publication indicates that one single company, i.e., banking actors or mobile network operators, cannot make mobile payment service innovations alone. Financial service providers play an important role in the mobile payment process but receive separate benefits from other participants. Furthermore, in this publication, I suggest possible solutions to promote the further development of mobile payment service innovations, such as developing generally accepted integrative solutions or merging various procedures into an interoperability system for interconnected participants.

This publication contributes to innovation in service theory and mobile payment theory in regard to conceptualization and characterization. The publication develops a morphological method to conceptualize and characterize innovative mobile payment procedures. Also, the publication provides several suggestions for executives in terms of promoting their mobile payment solutions.

Publication II presents a model of mobile payment service adoption from the perspective of consumers. The model in this publication is presented by expanding the technology acceptance model (TAM), the innovation diffusion theory (IDT), and the unified theory of acceptance and use of technology (UTAUT). This empirical study specifies six significant determinants of mobile payment adoption in China. This publication verifies the essential determinant of the perceived usefulness, which was proposed

in TAM related studies, in the context of mobile payment. In addition, this publication indicates that the determinant of compatibility has the strongest influence on the adoption of mobile payment services. Moreover, the article points to the importance of interconnecting mobile payment applications with other payment solutions and methods. By comparing the results with the related research in Finland, Korea, Germany, and the USA, Publication II partially explains the reasons why it is difficult to successfully replicate other mobile payment solutions in a specific society.

Publication II contributes to innovation diffusion theory from the service perspective. It also contributes to adoption theory from the consumer perspective. The publication offers several implications for managers in terms of marketing mobile payment solutions in different societies and increasing consumers' intentions to use these innovative services.

Publication III introduces a RISE model for the differentiation of innovation patterns in terms of diverse resources and capabilities affecting firms' coopetitive advantages in a coopetitive environment. China was selected as a representative coopetitive environment where a great number of participants compete and collaborate simultaneously. The publication studies three popular mobile payment cases in China: Alipay, Bestpay, and UnionPay. These mobile payment solutions were initiated by three representative innovators including Alibaba Group (third-party actor), China Telecom (mobile network operator), and UnionPay (banking actor) respectively. Through the cross-case study, the publication demonstrates why and how innovators utilize their ecosystems according to the jointly conducted innovation activities of mobile payment platforms and services. The publication suggests that the firms may develop their strategies by recognizing not only their own superior/inferior resources and capabilities but also the participants' superior/inferior resources to achieve coopetitive advantages in a coopetitive environment .

Publication III contributes to resource-advantage theory and platform ecosystem theory. The RISE model can be used to analyze and identify the effects of strategy execution for achieving win-win relationships in interfirm co-innovation. The publication helps executives to map their service innovation strategies to their platform ecosystem architectures and to recognize how resource-advantage challenges affect the execution strategy of their platform ecosystems.

Publication IV delivers a DISCO model to explore how a company adjusts its strategic moves for sustainable service innovation in a coopetitive

environment based on the dynamics of coopetition in strategic domains. The publication reports observations and analysis based on the strategic movements that the case company has performed over time. In addition, the publication presents an analysis of the case study according to the DISCO model. The results from the findings indicate that collective innovation has the potential to be a successful strategy for firms' survival in a coopetitive environment through superior competencies. The publication suggests that the firms should pursue ways to manage the paradoxical relationships in a coopetitive environment, such as solving the coopetition dilemma with platform-as-a-strategy, managing the challenges of resource allocation with a new deal regarding heterogeneous resources, and taking the control dilemma into account with regard to leadership in collective activities between partnerships.

Publication IV contributes to coopetition theory, resource-based view theory, and platform ecosystem theory. The DISCO model proposed in this publication can be used to analyze and elaborate on the steps and stages a company needs to complete to enter a coopetitive ecosystem. The publication helps executives to manage the paradoxical relationships that arise in terms of the challenges in a coopetitive environment from both an operational and a strategic perspective.

Publication V introduces the construction of a resource-based coopetitive innovation strategy analysis model — namely, the COIN model for managing coopetition in digital ecosystems. In addition to presenting the construction of the model, the publication applies the COIN model to four exemplary cases of mobile payment service innovations, i.e., Alipay, Bestpay, Elisa Wallet, and Apple Pay, using three breakdown matrixes of the model: the Consumer Matrix, the Business Matrix, and the Resource Matrix. The publication presents analysis of the cases to show how the mobile payment competitors reflect their innovation strategies in the COIN model and the breakdown matrixes.

Publication V makes a number of contributions to the field of digital ecosystems by performing coopetitive innovation strategy analysis. The proposed COIN model along with the Consumer Matrix, the Business Matrix, and the Resource Matrix enable executives and designers of the firms in a coopetitive business environment to identify how coopetition impacts their strategies. In addition, the publication helps executives and designers understand the dynamics of coopetitive interactions between competitors and the balancing of cooperation and competition. Furthermore, the

COIN model along with the breakdown matrixes can be used to identify internal superior and inferior resources for the differentiation of innovation strategy as competitive innovation or cooperative strategy.

1.4 Structure of the dissertation

The structure of the dissertation is organized according to the research framework and research lens as shown in Figure 2.1 as well as the research questions presented in Chapter 3.

Chapter 1 is an introductory chapter that describes the background and motivation, scope of the research, a summary of contributions, and the structure of the dissertation. Chapter 2 provides a literature review of the related research. The research questions of the dissertation are introduced in Chapter 3. Chapter 4 summarizes the methodological approaches, research process, and the data collection and analysis of the study. Chapter 5 summarizes the results in terms of the research questions. Chapter 6 addresses the research questions and discusses the implications, limitations, and future work directions.

2. Literature Review

This chapter reviews major literature that is relevant and representative. The aim of this chapter is to identify the focuses and significant gaps in the literature, the topics in which published research is lacking, and the methods applied in the relevant research. The findings will ensure that this dissertation does not repeat pre-existing research or make use of a fruitless approach (Randolph, 2009). With this in mind, the chapter conducts a literature review on the research focus, i.e., mobile payment service innovation, following the research lens mentioned in Chapter 1.

This chapter summarizes the quantitative and qualitative results of the literature review. Section 2.1 presents the search strategy used in the literature review. Section 2.2 discusses the research framework for the literature review. The quantitative analysis of the literature review is presented in Section 2.3, which includes the results based on the coding scheme and a taxonomy of the literature based on the research lens. Section 2.4 describes the qualitative findings of the literature review based on the research lens in this dissertation.

2.1 Literature search strategy

2.1.1 Search method

Following the method used by David and Han (2004) (David and Han, 2004), this research study conducted a search strategy to identify major articles that would be relevant and representative using the following steps:

1) The reviewed articles were collected from journals and conferences using major electronic databases including EBSCO, ScienceDirect,

Proquest, JSTOR, and Wiley, etc. In particular, this research preferred literature from leading journals and conferences in IS, e-commerce, m-commerce, and strategy management areas.

2) The search terms were entered in Google Scholar and the relevant articles were selected from page 1 to 20.

3) The titles or the abstracts of the selected articles include one or more keywords in order to ensure correlation.

4) The selected articles focus on mobile payments and related fields. All articles about patent were excluded. In addition, this study excluded articles in which the keyword of "ecosystem" related to natural environmental ecosystems.

5) Multiple keywords were combined for a comprehensive search and original sources were selected to remove the duplicate articles.

6) The full text of all remaining documents were viewed to ensure that the research themes and research contents were relevant.

7) "Snowballing" was used to track cited articles that were relevant.

2.1.2 Inclusion/exclusion criteria

This dissertation focuses on mobile payment service innovations; therefore, the major search keywords are "mobile payment", "mobile payment service", "mobile banking", "mobile money", "mobile wallet", "RFID", "mobile financial service","NFC", "Internet", "finance", "innovation", "service innovation", "strategy", "new service development", "network effect", "platform", "multi-sided platform", "coopetition", "competition", "cooperation", "ecosystem", "business ecosystem", "two-sided market", "platform competition", "E/M-business", and "business model". A combination of two or three words was used to find the most relevant articles. Thus, a total number of 365 articles were collected. On this basis, the study identified a total of 245 articles, based on the abstracts and full-texts of the original 365 articles, to be included in this literature review.

2.2 Framework for the literature review

This dissertation designed a research framework (see Figure 2.1) for the literature review to describe the logic of the research and to guide the re-

search process used. This framework applies a "resource — environment — strategy — performance" logic based on a resource-based view (Barney, 1991; Wernerfelt, 1984), a contingency view (Hofer, 1975; Murray, 1988) of generic strategy theory (Porter, 1980), and a "belief — attitude —- intention — behavior" logic (Ajzen, 1991; Fishbein and Ajzen, 1975) based on guiding theories, i.e., rational behavior theory (Simon, 1955), and behavioral intention and behavioral expectation theory (Warshaw and Davis, 1985).

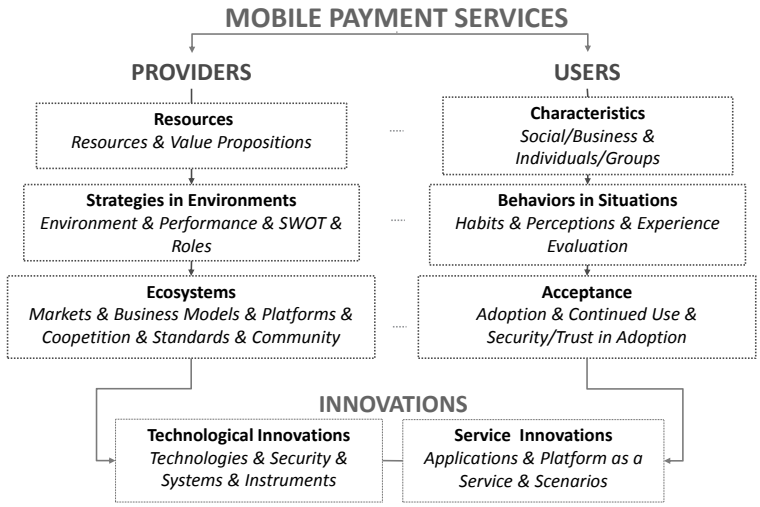

Figure 2.1. Research framework and research lens.

As shown in Figure 2.1, the research lens starts with the mobile payment services, and splits into two bypasses of key actors: the providers and the users involved in the mobile payment services. It ends with the innovations in service (Barras, 1986) and in technology (Abernathy and Utterback, 1978). Both providers and users are co-producers of innovations in mobile payment services (Balocco et al., 2008; Harasim and Klimontowicz, 2013; van der Boor et al., 2014). The providers offer mobile payment services to the users. The users make a decision to use an available mobile payment service.

According to the logic of this research framework, the research lens is described in Figure 2.1, consisting of the bypasses of providers and users. The bypass of providers is depicted in resources (Hall, 1992; Penrose, 1959) and value propositions (Ondrus et al., 2005) – strategies in environments (Barney, 1991; Porter, 1980) – ecosystems (Dagnino and Padula, 2002; Gnyawali and Park, 2011; Moore, 1996). The bypass of users is il-

lustrated in facilitating conditions (Triandis, 1979) in social or business requisites and self-efficacy (Bandura, 1977) in individuals or groups – behaviors in situations (Warshaw and Davis, 1985) – acceptance (Davis, 1989; Moore, 1993; Rogers, 2010).

Each provider has its own "resources", superior resources or inferior resources (Peteraf, 1993). According to generic contingency theory (Murray, 1988), the providers would succeed or fail depending on their strategies in terms of how to use firms' resources and environmental influences. The providers develop their positional strategies in a business environment very much like living creatures in an ecosystem (Iansiti and Levien, 2004c). Based on the environmental influences on their tangible and intangible resources and value propositions, the providers make their strategic decision-making and implementing processes in a business ecosystem (Kauffman et al., 2013; Moore, 1996).

The innovations in mobile payment, either radical or incremental, were mainly driven by the development of technologies, e.g., information and communications technology (ICT) (Bouwman et al., 2008). Usually, innovations in technologies (Abernathy and Utterback, 1978) require less user involvement in innovating processes. However, innovations in services (Miles, 2005) require users to partake in many tasks, which consequently affects their willingness to accept innovations. Users are not only actors or co-producers of service innovations. They also place demands on innovative services and play a key role in the diffusion of innovations (Dahlberg and Öörni, 2007; Rogers, 2010).

While taking part in social or business activities, each user has unique characteristics as an individual or as a member of a group. All participants will face barriers to maintain the desired behaviors related to these activities when it comes to situation-specific innovations (Lu et al., 2005). The users make decisions related to the acceptance of innovative services based on their perceived beliefs, perceptions, and evaluations to the new innovative services (Davis, 1989). Behavioral changes related to the use of innovative mobile payment services require a period of time. However, the changes will last a long time in terms of desired behavior (Harasim and Klimontowicz, 2013).

2.3 Quantitative analysis of the literature review

2.3.1 Coding schemes

In order to sort out the selected articles, this literature review used coding schemes. The technique of the coding schemes was taken into account to develop narrative summaries according to the recommendations by (Gall and Borg, 1996; Randolph, 2009). The coding schemes are listed as follows:

1) Historical-comparative identification of publications.
2) Publication venues: journal articles, conference proceedings, technical reports, books (or book sections), thesis, and working papers.
3) Research approaches: empirical and conceptual approaches (Cater-Steel et al., 2009).

2.3.2 Results based on the coding schemes

The articles were reviewed following the coding schemes as described above. Figure 2.2 presents the number of publications produced each year from 1998 to 2014. The field has seen a growing number of publications since the end of the 1990s. This corresponds to a great number of pilot innovations in mobile payments over the last two decades.

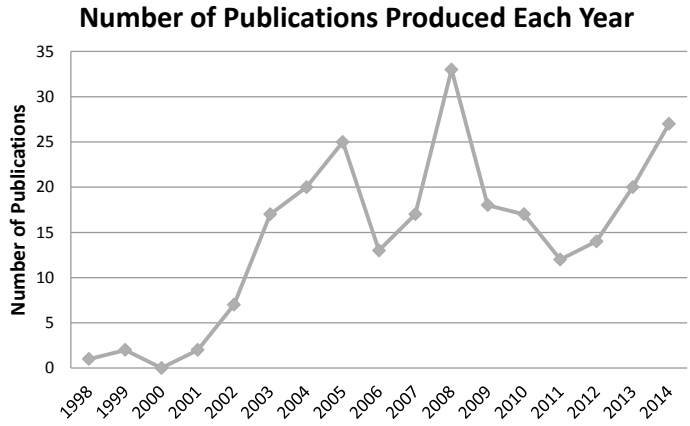

Figure 2.2. Number of Publications Produced Each Year.

In addition, as plotted in Figure 2.3, the field has 118 (48.2%) conference

articles, 100 (40.8%) journal papers, and 27 (11.0%) other publications in technical reports, books or book sections, theses, and working papers.

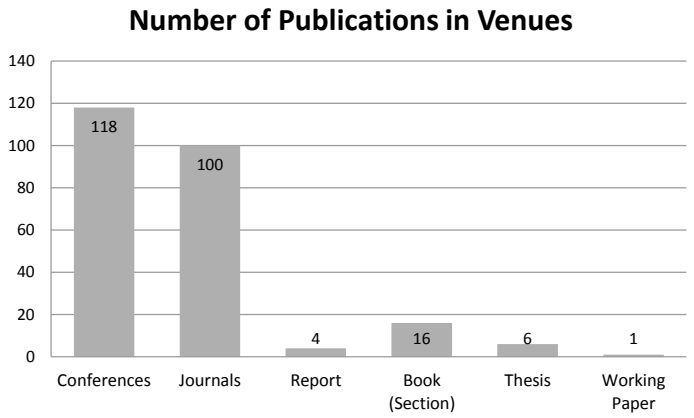

Figure 2.3. Number of Publications in Venues.

In total, the field has 119 (48.6%) conceptual research studies and 112 (45.7%) empirical studies. Moreover, 14 (5.7%) articles applied not only conceptual but also empirical methodologies.

2.3.3 A taxonomy of the literature review

This literature review used the lens of mobile payment service innovation for further classification of the literature, as depicted in Figure 2.4. The research lens included four perspectives: an overview perspective, an innovation perspective (i.e., service and technological innovations), the perspective of users (i.e., acceptance, behaviors in situations, and characteristics), and the perspective of providers(i.e., ecosystems, strategies in environments, and resources).

Figure 2.4 shows the number of publications in terms of the research lens and coding schemes of the research approaches. First, scholars slightly preferred applying the notion of a conceptual framework to conduct their studies (48.6%) rather than using empirical approaches (45.7%). A few studies (5.7%) adopted not only conceptual but also empirical approaches. Second, 110 articles focused on the innovation perspective. Most of them focused on innovation in technology (86.4%). Only 15 (13.6%) papers concentrated on innovation in service. Third, most literature from the users' perspective studied user acceptance (79.8%) and preferred empiricism (67.2%). Fourth, the previous scholars have conducted less research from the providers perspective (61 articles) than from the innovation per-

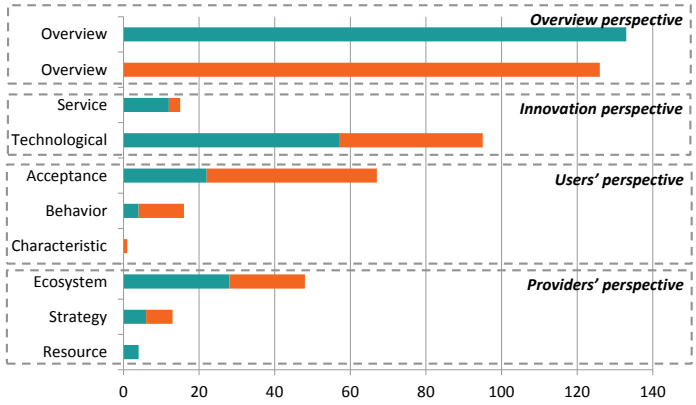

Figure 2.4. Number of Publications in Research Lens and Approaches.

spective (110 articles) and the users perspectives (84 articles).

Figure 2.5 illustrates the number of publications related to each focus of the research lens within the framework (see Figure 2.1). Additionally, it presents the amount of research studies conducted in each focus of the research lens, as represented by different colors. The boxes in colors show that more research studies were presented in the relevant literature and vice versa. Different colors reflect the amount of publications in certain areas of the literature. The darker the box color is, the more articles were published in the area. The white boxes denote that only a small amount of literature was found based on those focuses.

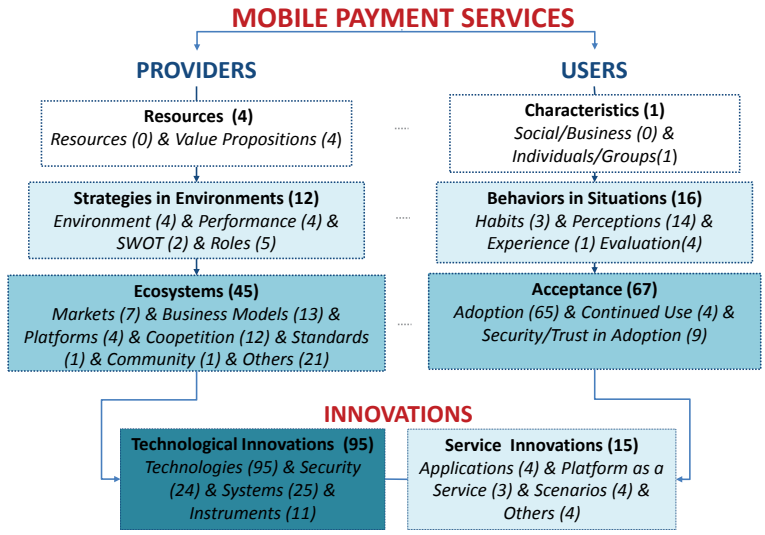

Figure 2.5. Number of Publications in Research Lens.

As illustrated in this figure, numerous studies mentioned mobile payment services but mainly focused on innovations in technology (95 out of 245). Many studies concentrated on security, systems, or instruments from the perspective of technological innovations. Second, much research was dedicated to acceptance (67 out of 245) and ecosystems (45 out of 245). The research on acceptance focused on the adoption determinants. Little research studied continued use from the perspective of users. The research on ecosystems discussed markets, business models, platforms, coopetitions, standards, community, and other topics. Third, compared to 95 articles about technological innovation, only 15, studied innovations in services, such as applications, platform as a service (PaaS), and scenarios.

2.4 Qualitative results of the literature review

Theoretically, this study builds on the concept of mobile payment service innovations through the research lens described previously. Based on the lens, the study classifies the literature according to the identified focuses illustrated in Figure 2.5. Additionally, the study offers meaningful statements according to the suggestion of Randolph (2009).

The rest of this section discusses the qualitative findings of the literature review based on the research lens. These findings constitute the theoretical background of this dissertation. Section 2.4.1 discusses the conceptualizations of mobile payment and mobile payment services. The findings from the innovation perspective, the users' perspective, and the providers' perspective are presented in Section 2.4.2, Section 2.4.3, and Section 2.4.4 respectively.

2.4.1 Mobile payment and mobile payment services

Previous literature explains mobile payment from the perspective of the payment instruments involved in the processes of making payments. A lot of research has defined mobile payment, also known as m-payment, as a new and alternative payment method wherein a mobile device is involved in the processes of payment. (Au and Kauffman, 2008; Dahlberg and Öörni, 2007; Karnouskos, 2004; Karnouskos et al., 2004; Mallat and Dahlberg, 2005). These definitions point to the fact that mobile payments do not restrict themselves to payments via mobile phone but can be made with any mobile device such as a smart phone, PDA, tablet, PC, or even

a merchant-operated terminal (Karnouskos, 2004). Some studies continue to emphasize making payments through mobile phones (Mallat and Dahlberg, 2005). Others have clarified that mobile payment is a terminology that refers to making payments using mobile technology, including not only mobile handset-based technology but also contactless card-based solutions (Chen and Adams, 2004; de Reuver et al., 2014; Dewan and Chen, 2005; Zmijewska, 2005).

Instead, other researchers define mobile payment as any wireless payment that makes use of mobile technology, such as handset-based (e.g., escrow payment, quick response code (QR) payment), contactless card-based (e.g., near field communication (NFC) and radio-frequency identification (RFID) payment solutions (Dahlberg, 2015; de Reuver et al., 2014; Dewan and Chen, 2005; Karnouskos, 2004), and other smart instruments (e.g., wearable and unwearable smart devices). This dissertation, on the other hand, considers mobile payment services as a range of payment-enabled services via a mobility way in which mobile technology facilitates real-time and context-specific transactions between consumers and collaborating companies. Emerging mobile payment solutions and services can be classified by means of three criteria: proximity payment (e.g., offline purchases and authentications), remote payment (e.g., online escrow payments and transactions), and online-to-offline (O2O) payment which allows users to pay via their handsets and consume goods or services from an offline merchant.

2.4.2 Innovation perspective

In the context of this dissertation, innovation is defined as the process of introducing new ideas to increase the performance of firm or customer value (Rogers, 1998). Normally, the "innovation" classification distinguishes a service or technology as incremental (containing a low degree of new knowledge) or radical (containing substantial new knowledge) (Dewar and Dutton, 1986). Successful innovation has been recognized as a key element for the survival of firms in the mobile-based service realm (Rothwell, 1992; Van Riel et al., 2004). A radically new product development requires less structure and more exploration than an incremental service innovation (Loch, 2000). In addition, radical innovations are somewhat more likely to be adopted by large firms (Dewar and Dutton, 1986).

Innovation is essential for enabling mobile payment solutions. Many innovative mobile payment solutions have been introduced and developed

in the last two decades. Some innovative mobile payment solutions go beyond the sphere of traditional payment service activities as described in the EU's Directive on Payment Services (PSD 2007/64/EC) (Mavromati, 2008). These innovations in mobile payment consist of technological innovations and service innovations.

Numerous scholars indicated that the development of ICT has driven the innovations in mobile payment (Bouwman et al., 2008), including wireless application protocol (WAP) (Meng and Ye, 2008), short message service (SMS) (Dukic and Katic, 2005; Fong and Lai, 2005; Harb et al., 2008; Soni, 2010), RFID technology (e.g., i-mode FeliCa of NTT DoCoMo, unveiled in July 2004; (Chen and Adams, 2004; Qadeer et al., 2009)), NFC technology (e.g., Elisa Lompakko in Finland, unveiled in August 2012; (Alliance, 2007; Apanasevic, 2013; Chen et al., 2011; Tan et al., 2014)), camera-based information transfer via QR technology (e.g., Alipay wallet by Alipay Co. Ltd, unveiled in January 2013; WeChat payment by Tencent Group, unveiled in January 2014 (Dinparast et al., 2013; Gao et al., 2009)), and code and Bluetooth-based communication (e.g., iBeacon by Apple for finger payment revolution, unveiled in July 2013 (Martínez-Peláez et al., 2008)).

Service innovation has long been discussed in the literature (Metcalfe and Miles, 2000; Miles, 2005), and a product-dominant logic has gradually been replaced by a service-dominant logic when it comes to innovation (Vargo and Lusch, 2008). The focus of innovation has been shifted from technological systems to business ecosystems (Eaton et al., 2011; Yoo et al., 2010). Additionally, the pattern of innovation has changed from self-organizational innovation to inter-organizational co-innovation (Kim et al., 2013; Lee et al., 2012). Co-innovation is a pattern of innovation that relates to inter-organizational co-creations. Co-innovation has been described in the literature as co-innovation (Lee et al., 2012), collaborative innovation (Baldwin and von Hippel, 2011), collective innovation (Carayol and Roux, 2005), and crowdsourcing innovation (Gassmann et al., 2014).

This dissertation defines co-innovation as a pattern of innovation to co-create value by multilevel organizations through a connected network or a strategic alliance (Carayol and Roux, 2005; Hardin, 1982; Hippel and Krogh, 2003; Kozinets et al., 2008). The relationship between actors involved in collective innovation actions (Carayol and Roux, 2005) is dynamic, enabling loose and almost instantly changing business connections. The actors in collective innovations may not pursue long time

partnerships but aim to achieve a collaborative goal in a short time at a point of business opportunity where all actors are needed.

2.4.3 User perspective

Innovation in mobile payment enables both online and offline payment solutions using one tool, i.e., mobile devices. Tangible and intangible innovations challenge previous assumptions of a product-dominant logic and create a shift to a service-dominant logic (Eaton et al., 2011; Tilson et al., 2010; Yoo et al., 2010). An innovative service is generated by a service process, and users take part in this process as co-producers. During the process, added value is created by multiple producers, and relative advantages are experienced by users (Edvardsson and Olsson, 1996). Thus, mobile payment innovation must be accepted by a user based on the logic of the user's behavioral intentions and on a good user outcome of core and supporting service offerings compared to the alternatives (Edvardsson and Olsson, 1996; Warshaw and Davis, 1985).

The behavioral intention of users is affected by their motivation according to the belief-attitude-intention-behavior relationship described in Davis' technology acceptance model (TAM) (Davis, 1989), which is based on the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). TAM theory explains factors relating to the perceived usefulness and perceived ease-of-use determining the acceptance of technology. In addition, the determinants of relative advantage and compatibility have been indicated by Rogers' innovation diffusion theory (IDT) (Rogers, 1962, 2010, 1998) and Moore's extension in information technology innovation (Moore and Benbasat, 1991; Moore, 1993). Notably, IDT's factor of compatibility was significantly confirmed in numerous studies on mobile payment acceptance (Chen, 2008; Kim et al., 2010; Mallat et al., 2009; Mallat and Tuunainen, 2008; Schierz et al., 2010; Yi et al., 2006; Zhong et al., 2013).

Moreover, TAM's determinants of perceived usefulness and perceived ease of use were highly recognized in research studies relating to mobile payment acceptance (Chen, 2008; Kim et al., 2010; Mallat et al., 2009; Shin, 2009). Furthermore, the e-commerce factor of trust was emphasized in terms of mobile payment acceptance (Gefen, 2002; Keen et al., 1999) (namely, trust (Shin, 2010; Zhou, 2014), perceived risk (Chen, 2008), or perceived security (Shin, 2009)). The TAM and IDT partially confirmed each other's findings, including the fact that the relative advantage is

conceptually similar to the perceived usefulness and the complexity is conceptually similar to the perceived ease-of-use (Mäntymäki and Salo, 2011a).

Previous studies indicated that consumers play a key role in demands on mobile payment services and also drive success by adopting and using specific services (Dahlberg and Öörni, 2007). Extensive prior research studies investigated consumer acceptance of mobile payments (Arvidsson, 2014; Chen, 2008; Cheong et al., 2004; Dahlberg and Öörni, 2007; Garrett et al., 2014; Kim et al., 2010; Mallat et al., 2009; Shin, 2010). A few research studies emphasized merchant acceptance (Mallat and Dahlberg, 2005; Mallat and Tuunainen, 2005, 2008). Conceptual models are the first step to investigate the determinants of mobile payments (Chandra et al., 2010; Chen and Adams, 2005; Dahlberg et al., 2003; Dewan and Chen, 2005; Mallat, 2007; Mallat et al., 2006; Ondrus and Pigneur, 2006; Pousttchi and Zenker, 2003; Teo et al., 2005; Viehland and Leong, 2007, 2010; Yang, 2005; Zmijewska, 2005; Zmijewska et al., 2004). Many studies applied both qualitative and quantitative methods (Chen, 2008; Cheong et al., 2004; Dahlberg and Öörni, 2007; Kim et al., 2010; Mallat and Tuunainen, 2008; Schierz et al., 2010; Shin, 2010; Zhong et al., 2013; Zhou, 2013, 2014) for validating their results. These studies were mainly based on acceptance theories of information technology such as TRA, TAM, IDT, theory of planned behavior (TPB) (Ajzen, 1991; Ajzen and Fishbein, 1980; Taylor and Todd, 1995), and unified theory of acceptance and use of theory (UTAUT) (Venkatesh and Davis, 2000; Venkatesh et al., 2003).

These studies also possess certain limitations for explaining mobile payment acceptance. Three of them are detailed as follows: (1) TAM and similar theories have a limited ability to explain users' decision behaviors, i.e., consumer' adoption of mobile payment in dynamic settings, in which the competitive environment is turbulent and numerous alternatives are available to the consumers. TAM tends to assume that there is a single technology available to users (Shin, 2009). (2) TAM and similar theories ignore several important situational factors, such as cultural issues, the business environment, alternative methods of making payments, and various legal and financial regulatory issues (López-Nicolás et al., 2008; Shin, 2009). Some situational factors, i.e., social norms and social influence were studied by integrated approaches such as UTAUT (Bouwman et al., 2007; Carlsson et al., 2006; Shin, 2009; Venkatesh and Davis, 2000; Venkatesh et al., 2003; Zhou et al., 2010) and other meta-analyses (King

and He, 2006; López-Nicolás et al., 2008). (3) TAM and similar theories assume that there are no barriers to prevent an individual from using a particular system if a user has chosen to do so (Shin, 2009). In fact, many barriers exist to prevent an individual from using a particular payment instrument, such as the availability and interoperability of a mobile payment supported by merchants or content suppliers.

Moreover, compared with the great amount of work done on technology adoption, little systematic effort has gone into providing insight into continued IS use (Kim and Malhotra, 2005) in the mobile payment domain. Several researchers have noted that the dynamic perspective (Weil and Utterback, 2005) and feedback behavior (Sterman, 2000) are important to explain consumer acceptance of mobile payment, i.e., consumer payment habits and their acceptance will change over time (Androulidakis et al., 2008; Dahlberg and Öörni, 2007; Lu et al., 2011; Ondrus and Pigneur, 2009; Yang et al., 2012). However, few studies provided insights into continued use of mobile payment (Zhou, 2013; Zhou et al., 2010), including the concepts of repeated or persistent behavior (Kim and Malhotra, 2005; Ronis et al., 1989), post-acceptance behaviors based on expectation-confirmation (Jasperson et al., 2005; Kang et al., 2009; Mäntymäki and Salo, 2011a,b; Saeed and Abdinnour-Helm, 2008; Thong et al., 2006; Venkatesh et al., 2003), the subsequent effect of feedback (Bajaj and Nidumolu, 1998), and the self-repetitiveness of user's behaviors or habits (Limayem and Hirt, 2003; Venkatesh and Davis, 2000).

2.4.4 Provider perspective

Over the past two decades, a huge number of mobile payment trails have failed to reach mass markets (Dahlberg et al., 2008a; Diniz et al., 2013). Some studies presented the challenges experienced by providers while they innovate mobile payment services, including the growth potential limitation due to specific service positioning (Ondrus and Pigneur, 2009) and the lack of multilevel organizational involvements to develop platforms and shape sustainable ecosystems (Dahlberg et al., 2006; Gaur and Ondrus, 2012). Several researchers indicated that the infrastructures and the categories of heterogeneous resources are essential for vibrant mobile payment ecosystems (Gaur et al., 2013; Gaur and Ondrus, 2012; Miao and Jayakar, 2013). Several researches investigated failures in the building of mobile payment platforms and ecosystems in developed economies (Dahlberg et al., 2008a; de Reuver et al., 2014; Gannamaneni

et al., 2015; Gaur et al., 2013; Nikou et al., 2012). Other studies presented the comparisons of the experiences in the creating mobile payment platforms and ecosystems in different societies (Miao and Jayakar, 2013; Zhong and Nieminen, 2015; Zhong et al., 2011).

Since money is generally defined and recognized as a medium of exchange and a store of value (Ferguson, 2008; McKinnon, 1963), some researchers attempted to interpret the acceptance of mobile payment services from the perspective of money theories (Arvidsson, 2014; Dahlberg, 2015; Fung et al., 2014; Hughes and Lonie, 2007). Generally, a desirable payment instrument should embody the characteristics of convenience, universality, certainty, security, economy, and information (Jacob et al., 2008). An important weakness of existing mobile payments is lack of universality, i.e., the compatibility of consumers' perceptions and the interoperability of the competitors' business offerings. This may cause a lack of users, i.e., merchants, during the early stages of mobile payment service commercializations (Gaur et al., 2013).

The concept of the business ecosystem (Moore, 1993, 1996) has been indicated as a crucial element for describing the new arena of mobile payment innovations (Gaur et al., 2013; Miao and Jayakar, 2013). In previous literature, scholars have paid increasing attention to the concept of business ecosystems for analyzing service innovations in digital industries, using various terms such as digital ecosystems (Briscoe and De Wilde, 2006; Eaton et al., 2011), digital business ecosystems (Heistracher et al., 2004; Nachira et al., 2007), innovation ecosystems (Adner, 2006; Adner and Kapoor, 2010), service ecosystems (Barros et al., 2006; Scholten and Scholten, 2010), mobile ecosystem (Basole, 2009; Lundberg and Moberg, 2003), and platform ecosystems (Basole and Karla, 2011; Ceccagnoli et al., 2012). Moore defined a business ecosystem as an economic community of organizations interacting (collaborating and competing) across a variety of industries (Moore, 1996). Usually, a business ecosystem consists of a large number of organizations interconnected but interdependent as they co-evolve in terms of innovations (Peltoniemi, 2006). Platform has become a key role for service innovations in digital ecosystems (Cusumano, 2010; Eaton et al., 2011) with the aim of creating positive network effects (network externality) (Au and Kauffman, 2008; Chou et al., 2004; Katz and Shapiro, 1994). However, like all multi-sided platform businesses, mobile payments suffer from the classic "chicken and egg" problem and find it difficult to establish a logical interconnection between com-

petitors in business networks (Evans, 2003; Gannamaneni and Ondrus, 2013). Thus, an appropriate innovation strategy is an essential element for the success of competitors building and maintaining healthy business ecosystems (Anggraeni et al., 2007; Göthlich and Wenzek, 2004; Iansiti and Levien, 2004a,b; Zhang and Liang, 2011).

Traditional competitive strategies, i.e., cost leadership, product differentiation, and focus, were constructed on the assumption of clear industry boundaries and players (Porter, 1980). The market transformation of business surroundings has been a challenge for Porter's competitive strategy (Ghazawneh and Henfridsson, 2011). The business interactions between actors come from their competition in Porter's industry (Bengtsson and Kock, 2000). However, the business interactions of actors participating in mobile payment serve innovations allow for the emergence of coopetition between actors and for the development of coopetitive market structures in the business environment (Bengtsson and Kock, 2000). Coopetition between actors is a tough task for innovation (Gnyawali and Park, 2011). The resource-based view and resources advantage theory have been suggested to help achieve a competitive advantage in decision making in terms of a single business strategy and a corporate strategy (Ghobadian et al., 2007; Hunt and Morgan, 1996, 2005; Peteraf, 1993). In a competitive environment, resource heterogeneity generates monopoly rents (Peteraf, 1993). However, the resource homogeneity may create conflicts and lead to a non-optimal solution (Barney, 1991). Hunt et al. introduced models to understand how firms' resources affect value creation, market position, and firm performance (Hunt and Morgan, 1996, 2005).

2.5 Summary and research gap

Based on the quantitative and qualitative results from the literature review presented previously, mobile payments have received growing attention from scholars over the past two decades. Numerous research studies have focused on mobile payment innovations in technologies and systems (95 out of 245 publications). Also, many publications have been produced related to consumers' adoption of mobile payment (65 out of 245 publications). Despite the constantly growing number of scientific publications, the current literature lacks studies in two aspects. One aspect is the users' characteristics and behaviors in situations where numerous alternative payment solutions are available to them (Bruton et al., 2015;

Simon, 1955; Teece, 2010). The other aspect is the firms' resources and strategies in environments, especially in a coopetitive business environment (Barney, 1991; Dagnino and Padula, 2002; Dyer and Singh, 1998; Gnyawali and Park, 2011). This dissertation strives to fill in this gap and allow for a better understanding of how the coopetitive market structure affects service innovations in terms of the service providers' strategies and the business consumers' behaviors.

3. Research Questions

This chapter presents the research questions in this dissertation. According to the research gap addressed in the summary of the literature review, the overall research question of this dissertation is formulated as follows:

- *How do firms manage coopetition while innovating mobile payment services?*

Suitable models are needed to understand how firms manage coopetition while innovating mobile payment services and understanding the consumers' behavior while adopting businesses that use these innovative mobile payment services. Therefore, this overall research question is answered by a strategy that divides the question into sub-questions according to the research lens addressed previously. The sub-questions are specified as follows:

1) How does a company select and adjust its strategy for sustainable service innovation in a coopetitive ecosystem?

2) What is the role of consumer adoption for mobile payment service innovation in coopetitive environment?

In order to answer these questions, this dissertation develops a set of models for analyzing coopetitive strategic selections and adjustments. It also applies these models to the case companies being studied (Publication III, Publication IV, and Publication V). In addition, this dissertation investigates and compares the mobile payment service innovations in the Finnish market and the Chinese market, where inter-industrial and interorganizational cooperation takes place to facilitate mobile payment solutions (Publication I). In terms of the consumer behavior perspective, the empirical experiences are needed. This dissertation thus presents a quantitative investigation to examine the factors affecting consumers' adoption

of mobile payment services in the Chinese market, which is a representative market within a coopetitive business environment (Publication II). In addition to the quantitative investigation of a survey, this dissertation includes the Consumer Matrix and the Business Matrix in an analysis model in Publication V in order to express the consumers' behavioral intentions. It also reflects the outcome of business offerings competing with the alternatives in a complex business environment.

4. Methodology

This chapter describes and discusses the methodological approach of this dissertation as a whole. Section 4.1 shows the different methodologies used in this research to collect and analyze data for the five publications included in this dissertation. Section 4.2 describes the complete research process of this dissertation. Section 4.3 presents the data collection and the data analysis of this dissertation.

4.1 Research approach

According to the literature review (see Chapter 2), major publications in the field of mobile payment service innovations applied both empirical and conceptual approaches, following the guidance of traditional information system (IS) research. Normally, conceptual analysis aims to produce or discuss concepts, such as historical reviews, argumentations, the development of conceptual frameworks, and theoretical models (Cater-Steel et al., 2009). In contrast, empirical study, which answers particular research questions, is conducted by collecting data through quantitative surveys, qualitative interviews, or experimental observations (Creswell, 2013). In many cases, the empirical studies adopted mixed methods, such as case studies and design research (Yin, 2014).

This dissertation follows a multi-method approach with a sequential mix of conceptual and empirical methods (Johnson and Onwuegbuzie, 2004; Mingers, 2001; Tashakkori and Teddlie, 2010). The multi-method approach is normally applied for gaining a deep understanding and a wide-angle perspective of the emerging topic (Kaplan and Duchon, 1988; Lee, 1991). In practice, this dissertation is a mixed methods study applying multiple methods as follows (see Table 4.1). The detailed forms and questionnaires of data collections are respectively listed and presented in

Table 4.1. Mapping research questions to the methods applied in the publications

Publications	Approaches		Methods and Data					RQs	
	Conceptual	*Empirical*	*Case study*	*Survey*	*Interview*	*Observation*	*Document*	*Q1*	*Q2*
Publication I	✓		✓			✓	✓	✓	
Publication II		✓		✓	✓				✓
Publication III	✓	✓	✓		✓	✓	✓	✓	
Publication IV	✓	✓	✓		✓	✓	✓	✓	
Publication V	✓	✓	✓		✓	✓	✓	✓	✓

the publications included in this dissertation.

4.2 Research process

The research process started in 2008. The complete research process, including the different phases, is illustrated in Table 4.2. The rows represent the research process phases. The columns describe the different research objectives, the data collections, and the reports produced and included in this dissertation.

The starting point of the research is to establish an industrial and theoretical background for the study through a literature review and industrial investigations of mobile payment innovations and of the mobile business environment. Publication I compares innovative mobile payment procedures in the Finnish and Chinese markets. In addition to the industrial investigations (Autumn 2008 to Spring 2009 and Autumn 2009 to Autumn 2010), other empirical data were collected from Spring 2011 to Autumn 2014: 39 interviews with 20 managers, 2 industry experts, 2 academic experts, 6 R&D staff, 3 business promotion officers, and 6 experienced users; a consumers' survey (N=365); historical and field observations; archival records; and documents. The empirical data of the consumers' survey were conducted to explore the factors affecting the consumer adoption of innovative mobile payment services in the Chinese market. The results from the analysis of the consumers' survey were presented in Publication II. In order to understand the user experience of the mobile payment innovative services in practice, three cases, i.e., Elisa Wallet, Alipay Wallet, and PayPal Mobile, were prototyped using Axur-

Table 4.2. Research process phases

Phases	Objectives	Data	Reports
Autumn 2008 – Spring 2009	Establishing academic and industrial background on mobile payment innovations.	Literature review on innovation in services and industrial investigations in cases (N=10).	Publication I compares mobile payment service innovations in two markets.
Autumn 2009 – Autumn 2010	Investigating industrial state-of-the-art and Establishing theoretical foundation.	Industrial investigations and literature review on innovation in services.	Publication III, IV, and V compare mobile payment service innovations in different markets.
Spring 2011 – Spring 2013	Exploratory study on consumer adoption of mobile payment.	Interviews (N=39), usability study (N=40), and consumer survey (N=365).	Publication II explores factors affecting consumer adoption of mobile payment in a specific market.
Spring 2013 – Autumn 2014	Modeling study on analysis of providers' innovation strategies.	Industrial cases (five case solutions and the related initiator companies) and literature review on innovation strategy.	Publication III, IV, and V present models for analyzing providers' innovation strategies in coopetitive environment.

eRP 6.5 and tested using a usability inspection method (Nielsen, 1994) in the Finnish and Chinese market in Autumn 2013.

The objectives of Publication III, Publication IV, and Publication V are to illustrate a deep understanding of the mobile payment service providers' innovation strategies in a specific environment. These publications (Publication III, Publication IV, and Publication V) make use of a multi-method approach in case studies, including an in-depth case study (Publication IV) and two cross-case studies (Publication III uses three case companies in the Chinese market, while Publication V uses two cases in the Chinese market, one case in the Finnish market, and one case in the global market) (Yin, 2009).

4.3 Data collection and analysis

This dissertation collected the quantitative data from the consumer survey and the qualitative primary and secondary data in line with the container suggested by Yin and Romano et al. (Romano Jr et al., 2003; Yin,

2013).

The quantitative data for the consumer exploratory study (Publication II) was conducted through a survey in China. The survey of the five point Likert scale questionnaires (35 measurement items) was executed through online and printed questionnaires, and some respondents were mailed. A total of 365 valid responses were completed and received during April — November in 2011 and January — April in 2013.

The quantitative data analysis was analyzed through a statistical methodology of structural equation modeling (SEM) via statistical tool SPSS 19 software and AMOS version 20 software. By using the confirmatory factor analysis (CFA), effective questionnaire items were chosen for their strong reliability and validity in the research.

The qualitative data for the case studies included semi-structured interviews (Rubin and Rubin, 2011), the documentation, archival records, interviews, direct observations, and participant observations (Yin, 2013). The interviews took place during April — May in 2011 and October — November in 2013 with several specific questions and open topics. Firms' managers who took initiatives in innovating mobile payment services were interviewed in order to get insights into different hierarchical levels . Each interview lasted, on average, for about 50 minutes during the first-round interviews and 30 minutes during the second-round interviews. These interviews were either audio-recorded with the interviewees' permission or written on notes. All respondents were assured that they were to be anonymous while using the data in this research.

The qualitative data analysis was conducted via a tool of the Atlas.ti software, following Strauss and Corbin' s guidelines (Strauss and Corbin, 1990) on grounded theory methodology and using mixed methods: interpretation of the data using the coding strategies of open coding, axial coding and selected coding, as well as Romano et al.'s four-step process methodology (Romano Jr et al., 2003): elicitation, reduction, visualization, and comparative analysis. The interview transcripts, verbatim in full or partially (Glaser, 1992), the observation memos, the field notes and other sources were gathered in the Atlas.ti software. Then, the data were analyzed using open coding for similar text segments, axial coding for conceptual categorization, and selected coding for summarizing the conceptual categories. In each publication, the presented theoretical foundation give the conceptual basis for the codes contextualization.

5. Results

This chapter gives a summary of the key results acquired in the research work comprising this dissertation. The full results are detailed in the publications attached at the end of the dissertation. The sections of this chapter are organized according to the research framework described in Chapter 2 and the research questions listed in Chapter 3. This chapter is divided into three parts: Section 5.1 addresses the conceptual categorization of innovations in the domain of mobile payment services emerging in different environments. The detailed results of Section 5.1 are mainly presented in Publication I. Section 5.2 delivers the research on the influential factors in the consumer adoption of businesses that use mobile payments, particularly in a coopetitive environment. The detailed results of Section 5.2 are mainly reported in Publication II. Section 5.3 delivers the strategy analysis models for firms to manage coopetition, in terms of consumers, businesses, and resources, while innovating mobile payment services. The detailed results are addressed in Publication III, Publication IV, and Publication V.

5.1 Characterizing mobile payment service innovations

The fundamental starting point for understanding the appropriateness of a strategy for firms to manage coopetition begins by investigating and characterizing mobile payment service innovations in different environments. This dissertation studies mobile payment market environments for the understanding of industrial state-of-the-art of mobile payments in terms of the major mobile payment solutions and key payment alternative solutions; the key organizations involved in providing and supporting mobile payment solutions; and the environmental factors, such as the social/culture environment, the technological environment, the economic

environment, and the regulatory/legal environment (Au and Kauffman, 2008; Dahlberg et al., 2008b). In addition, this research reviews literature for conceptualizing and categorizing the mobile payment solutions based on the case investigations and analysis in the Finnish and Chinese market.

This dissertation (see Publication I) investigates, compares, and characterizes the mobile payment service innovations in the Finnish and Chinese market. Publication I categorizes the characteristics of existing and emerging mobile payments as show in Figure 5.1, which are based on the morphological method (Kreyer et al., 2002a,b, 2003; Pousttchi, 2003; Zwicky, 1966). This publication described mobile payment with morphology frameworks of differentiated characteristics (e.g., strategic, participants, and operational) to classify and distinguish a mobile payment from each other (Zhong, 2009). Publication I also attempts to describe mobile payments in a broad and underlying way though the morphology framework. The clarification of mobile payment differentiated characteristics through the morphology framework point out a direction to explain why and how mobile payment appears heterogeneously in innovative services, businesses, and platform ecosystems.

Characteristic			Instances				
Strategic	S_1	Payment levels	S_{11} Picopayments	S_{12} Micropayments	S_{13} Macropayments		
	S_2	Services scope	S_{21} Regional	S_{22} National	S_{23} International (Incl. EU)		
Participants	P_1	Payment provider	P_{11} MNO	P_{12} Bank/FSP	P_{13} Third Party/Spec. intermediary	P_{14} MNO+ Bank/FSP	P_{15} Others
	P_2	Pre-registration	P_{21} Yes			P_{22} No	
	P_3	Technology required	P_{31} Text-message exchange (SMS)	P_{32} Internet-enabled phone(WEB/WAP)	P_{33} Dual-slot/dual-card phone	P_{34} Special payment software	
Operational	O_1	Basis of payment	O_{11} Token-based	O_{12} Account-based			
	O_2	Deduction time	O_{21} Prepaid	O_{22} Instant-paid	O_{23} Post-paid		
	O_3	Method for settlement	O_{31} Cards	O_{32} Telephone bill			

Figure 5.1. Modified morphological box of mobile payment characteristics and instances; in Publication I.

In addition, a cross-case study was conducted by applying this morphological box of mobile payment characteristics and instances in Publication I, as depicted in Figure 5.2. Publication I introduced several cases of mobile payment service innovations from the Finnish, Chinese, and international markets. Most of these mobile payment innovative solutions in the

Chines market are currently surviving. However, only few of them (e.g., Helsinki City Transport Ticket service) still exist and reach a relatively large scale in today's Finnish market.

Cases	Characteristic																										
	Strategic						Participants														Operational						
	S_1			S_2			P_1						P_2		P_3				O_1		O_2			O_3			
	S_{11}	S_{12}	S_{13}	S_{21}	S_{22}	S_{23}	P_{11}	P_{12}	P_{13}	P_{14}	P_{15}	P_{21}	P_{22}	P_{31}	P_{32}	P_{33}	P_{34}	O_{11}	O_{12}	O_{21}	O_{22}	O_{23}	O_{31}	O_{32}
1		√		√					√				√	√					√			√		√
2		√			√		√					√		√					√	√				√
3		√				√					√	√		√					√		√	√	√	√
4		√	√			√				√		√			√	√			√		√	√	√	
5		√	√			√			√			√		√					√		√		√	
6	√	√			√				√	√		√		√	√				√	√				√
7	√	√		√					√	√		√		√	√				√	√			√	√
8		√	√	√					√		√	√		√	√				√		√	√	√	
9		√	√	√					√			√		√	√				√	√	√	√	√	
10	√	√		√					√			√		√	√				√	√			√	

Figure 5.2. Modified morphological box of cases; in Publication I.

As presented in Figure 5.2, the integrated partners such as third parties and specific intermediaries (P_{13}) can be seen in major cases in Chinese market but those partners cannot be often observed in Finnish market. Chinese third parties and specific intermediaries play a role in bringing many partners, e.g., banks, into mobile payment service innovation activities. However, mobile payment service innovations have little involvement with banking and other financial actors in the Finnish market. These observations were also confirmed by other studies, i.e., the lack of multilevel organizational support and the conflicts in collaboration between banks and other actors (Dahlberg et al., 2008a; de Reuver et al., 2014).

Mobile payment service innovation has long been released and discussed in many markets. Researchers recognized the M-PESA to be the most successful innovation of "mobile money" services launched in Africa (Mas and Morawczynski, 2009; Ngugi et al., 2010). In Japan, the NTT DoCoMo released the first "mobile wallet" service based on i-mode for customers in August of 2004 (Abu, 2010). Recently, Alibaba Group, an E-business and remote payment dominator in China, provides the most nationwide popular mobile wallet service, namely Alipay Wallet, that offers consumers numerous utilities and in-app purchase interfaces (CIW, 2014).

Although mobile payment has some successes as discussed above, it has not reached mass markets, especially in Western societies (de Reuver

et al., 2014; Gaur et al., 2013). As a pioneer in mobile payment service innovation, Finnish providers piloted mobile payments in the 1990s but endured numerous failures of mobile payment service innovations that may be caused by the lack of multilevel organizational support, and the conflicts in collaboration between banking and other actors (Dahlberg et al., 2008a; de Reuver et al., 2014).

Many innovative mobile payment services have recently emerged as a result of the collaboration of banks and non-bank stakeholders. NTT Docomo and MasterCard introduced mobile NFC payments to Japanese users in 2013. The Italian financial company SIA signed a card payment processing agreement with mobile commerce company Swish Payments to provide "Swish Wallet" to Africa and Europe (e.g., Denmark, Finland, Netherlands, France, and Germany) in 2014. According to the Monitise press release on 22 January 2014, a cooperative banking group bank OP-Pohjola delivered a multi-language (i.e., Finnish, Swedish and English) mPOS service "Pivo Wallet" under an agreement with a mobile money specialist Monitise in January 2014. Pivo Wallet delivers a platform for many daily spending services to the banking group's small business and merchant customers (European Payments Council (EPC), 2014; OP-Pohjola, 2013).

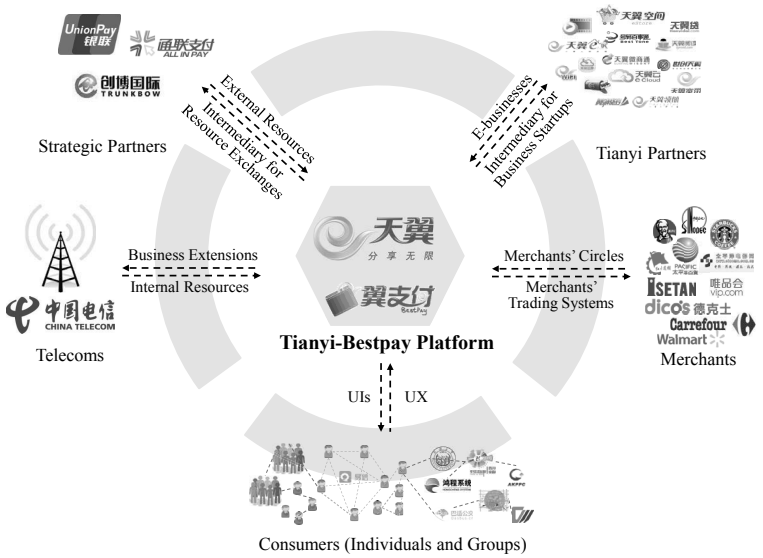

Figure 5.3. Multi-sided platform mechanism of China Telecom in mobile payment; in Publication IV.

Multiple stakeholders have been participating in those mobile payment

platforms, business networks and ecosystems. Figure 5.3 presents an example of the architecture of a multi-sided platform mechanism of China Telecom in mobile payment for collective innovating Bestpay Wallet service, which was launched to Chinese consumers and merchants in 2012.

A remote payment giant of Alipay, co-owned by the Alibaba Group, has launched its mobile payment solutions of Alipay Wallet since 2009. Alipay provides a great number of mobile payment services and functions through its mobile payment platform, such as Alipay Wallet, Alipay Express (PIN-free), Alipay QR, Alipay WAP, Yu'eBAO, Alipay Cross-border Mobile, and Ant Financial services. The inter-organizational platforms of Alibaba enable Alipay to perform rapid co-innovation for mobile payments and business connections (Zhong and Nieminen, 2015). Figure 5.4 introduces an example of the conceptual mechanism of the Alipay Wallet platform for purchasing in B2C (business-to-consumer) scenarios. This platform sets up a bridge between internal and external systems. The internal systems deal with data and money flows of Alipay transactions and payments. One external system is arranged for executing the exchanges of financial account information between issuing bank accounts and acquiring Alipay accounts. The other external system provides the authorization processes between consumers and business partners in connection with the Alipay Wallet's in-app user interfaces (UI) and business application programming interfaces (API).

5.2 The role of consumer adoption in coopetitive environments

A number of innovative mobile payment services have failed to be accepted by consumers and have not reached mass markets, especially in Western societies (Dahlberg et al., 2008a; de Reuver et al., 2014; Gaur et al., 2013). Therefore, the author of this dissertation designed a scenario-based focus group testing to understand how consumers use and evaluate mobile payment services. Three innovative mobile payment services, i.e., Alipay Wallet, Elisa Wallet, and PayPal, were selected from different environments according to Yin's (Yin, 2013) multiple-case selection technique for the user perception tests. Three demos were produced for prototyping the case applications by using a professional prototyping software AxureRP Pro 6.5. The examples of action flow diagrams of the mobile wallet cases are presented in Figure 5.5.

The testing observations indicate that mobile payment services are gen-

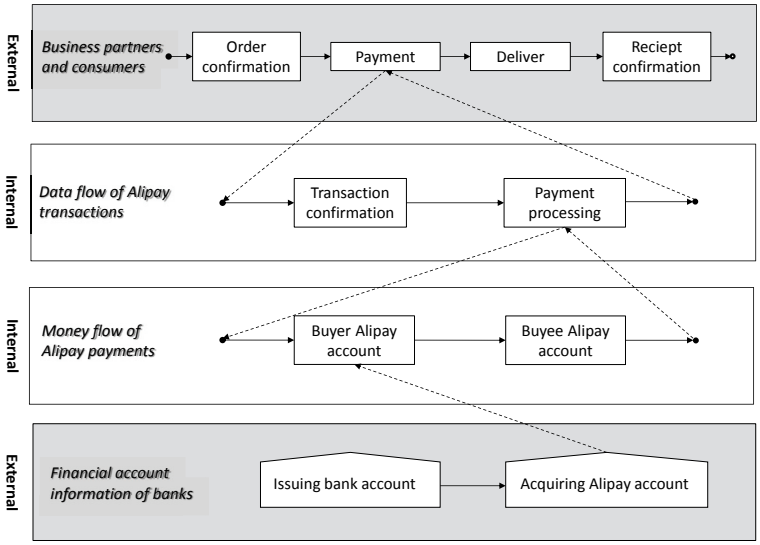

Figure 5.4. Conceptual platform mechanism of Alipay Wallet for purchasing in B2C scenario.

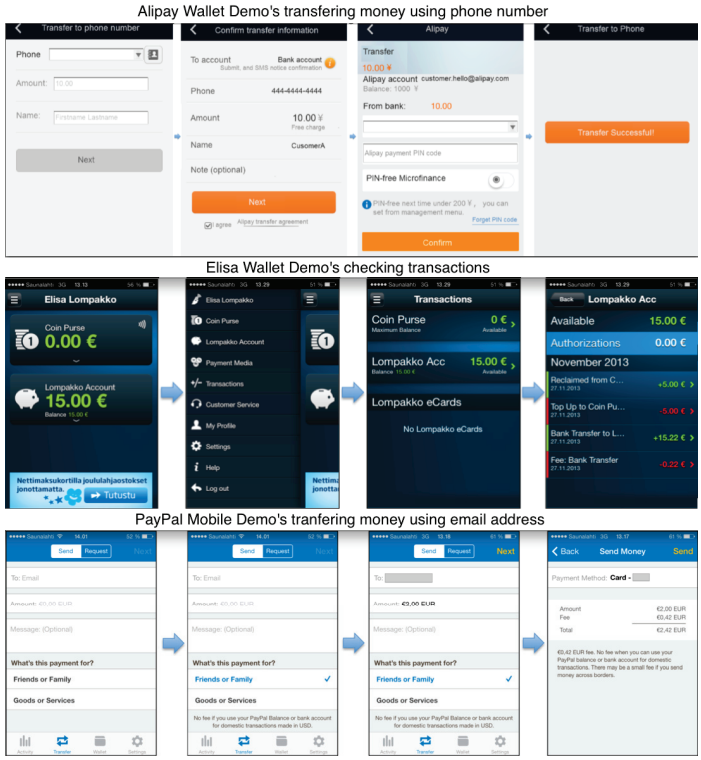

Figure 5.5. Examples of action flow diagrams: Alipay Wallet, Elisa Wallet, and PayPal.

erated by a set of service processes and the consumers take part in the service processes as co-producers (e.g., taking actions in the flows as presented in Figure 5.5). During the processes, the added values are created by multiple co-producers and the relative advantages are experienced by consumers. The mobile payment innovations must be accepted by consumers based on the logic of the consumers' behavioral intentions and good consumers' outcomes of innovative service offerings that compete with the alternative ones (Edvardsson and Olsson, 1996; Warshaw and Davis, 1985). Thus, consumers play a significant role in fueling the growth of the demands to the businesses that are facilitated by mobile payments.

Consequently, it is also necessary to understand the role of consumers' behavior while adopting businesses that use these innovative mobile payment services in coopetitive environments. Alternative solutions in a coopetitive business environment give consumers the right to choose one from numerous mobile payment solutions to achieve the same goal.

In order to understand the role of consumer adoption of mobile payment service innovation in coopetitive environments, this dissertation presents an empirical work of the consumer adoption of mobile payments in China, which is a representative coopetitive market (Publication II). Additionally, a conceptual study was conducted on the consumers' behavior perspective through a Consumer Matrix within a COIN (Coopetitive Innovation analysis) model (Publication V).

Publication II presents a quantitative investigation to examine the factors affecting consumers' adoption of mobile payment services in the Chinese market, which is a representative market within a coopetitive business environment (Publication II). As presented in Publication IV, the Chinese market was considered a typical coopetitive environment in this dissertation based on the fact of the numerous mobile payment innovative services launched by 269 licensed firms (People's Bank of China (PBC), 2014) and targeting to more than 205 million mobile subscribers who make mobile payments (CNNIC, 2014). Moreover, the firms in the Chinese market consist of actors from various industries, i.e., banking and non-banking institutions. The non-banking actors, e.g., Alibaba Group in China have considerable strength as banking actors in mobile payment service innovations. The considerable forces between banking and non-banking actors promote the possibility of cooperation between these competitors.

Publication II confirms the TAM's factors, i.e., the perceived usefulness and perceived ease-of-use. Moreover, the factors in terms of "cooperative advantage" (Publication V), i.e., compatibility and interconnection, were verified to have the most influence in the coopetitive environment, i.e., the Chinese market in this dissertation (Publication II). The coopetitive relationships of providers may deliver many barriers to prevent an individual from using a particular system, even if a user has chosen to do so (Publication V). Therefore, the factors in terms of "cooperative advantage", i.e., the compatibility and interconnection of mobile payment solutions, will affect the consumer adoption of mobile service innovation, especially in coopetitive environments (Publication II). The factors of e-payment habits (EPH) and interconnection (Inter) are determinations in Chinese market different from other markets (Zhong et al., 2013).

The factors of "EPH" and "Inter" are based on hypothesis 5 and hypothesis 6 in Publication II. Hypothesis 5 regards to the e-payment habit of consumers. That is to say, the behavior habit and the businesses for e-Commerce have a significant effect on mobile payment service adoption in the Chinese market. This effect implies that the innovative businesses are an important factor for producing successful mobile payment services as well in the Chinese market. This suggests a link between Business Matrix and Consumer Matrix (Publication V), which were introduced in the COIN model of Publication V. Also, it is a logical link between the competitive advantage of mobile payment services in Consumer Matrix and the competitive resources of mobile payment businesses in Business Matrix. Hypothesis 6 concerns to the interconnection of the mobile payment platform. It indicates that the cooperative advantage of mobile payment service is important for the adoption of consumers. That was pointed out in the horizontal axis of Consumer Matrix in the COIN model (Publication V).

That is to say, providers should improve not only "competitive advantage" but also "cooperative advantage" of their mobile payment service innovations to involve consumers in their businesses, which are facilitated by using mobile payments in a coopetitive environment (Publication V). Thus, this dissertation proposes the Consumer Matrix and Business Matrix in an analysis COIN model in Publication V to reflect the consumers' behavioral intention and the consumers' outcome of business offerings competing with the alternatives in a complex business environment. In the COIN model, the Consumer Matrix pictures the coopetitive advantage

and coopetitive disadvantage of the business offerings that are provided by the business ecosystems. The consumers serve as the end-users of a business ecosystem that comprise many participating competitors, experience business offerings, and communicate responses and feedback to the competitors.

5.3 Analysis models for firms managing coopetition

This dissertation presents a set of models for firms to manage coopetition while innovating mobile payment services. Using case studies, this research presents those models to show how a company selects (RISE model (Resources — Inter-/Self-organizational innovation — Ecosystem); Publication III) and adjusts (DISCO model (analysis model on the Dynamics of Innovation Strategy in Coopetitive business environments); Publication IV) its strategy for sustainable service innovation in terms of managing coopetition (COIN model (Coopetitive Innovation analysis) model); Publication V) in digital business ecosystems.

5.3.1 RISE model

The RISE model on service innovation in the coopetitive business environment is presented in Publication III. It is to illustrate why and how firms utilize ecosystems for innovative mobile payment service development to achieve coopetitive advantage based on firms' superior resources. Figure 5.6 delivers the RISE model.

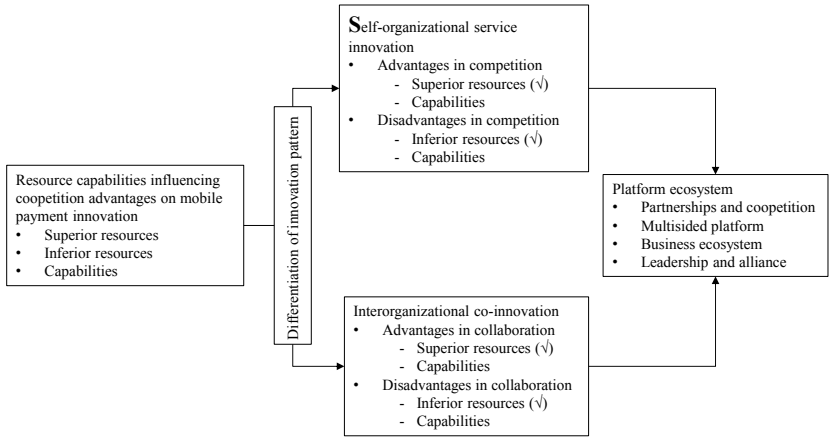

Figure 5.6. The RISE model; in Publication III.

Three representative Chinese initiator providers were studied and discussed in Publication III. The RISE model was applied in the representative cases, i.e., Alipay (third-party actor), Bestpay (mobile operator), and UnionPay (bank union). The data analysis was conducted according to the perspectives on the firms' activities and interactions of service co-innovation, the superior and inferior resources and capabilities, and the ecosystems established by firms through their innovation strategies.

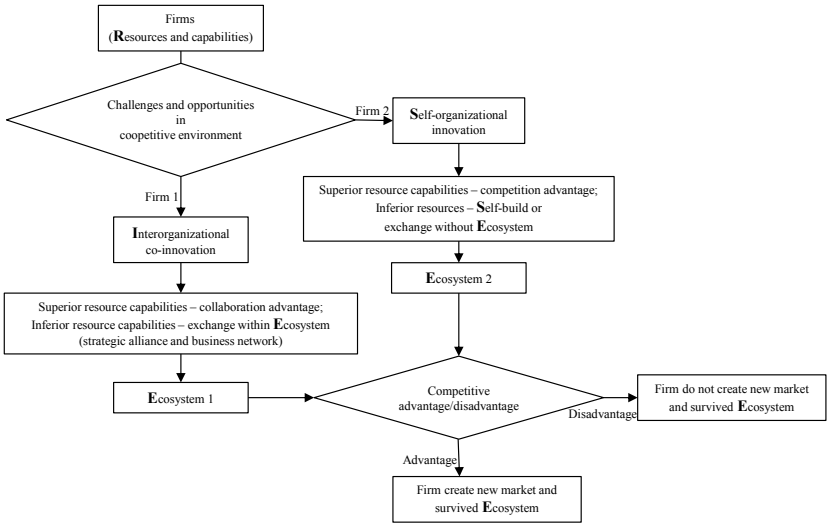

Figure 5.7. Innovation strategies affect the viability and survival of individual businesses and ecosystems; in Publication III.

Figure 5.7 illustrates the firms' strategic choices on the differentiation of service innovation patterns and their possibility of survival. The case analysis shows that the case firms have selected different strategies, i.e., self-organizational innovation and interorganizational co-innovation, for innovating mobile payment services in the coopetitive environment. In addition, their selections of strategies relate not only to their strategic objectives and strategic insights but also to their resources and capabilities regarding mobile payments.

The findings of Publication III indicate that the firms' strategy of interorganizational co-innovation appears to be successful for mobile payment service innovation in coopetitive environments. In addition to the strategic choice on the mobile payment service innovation in coopetitive environments, the understanding of firms' superior and inferior resources and capabilities may influence their coopetitive advantages in a coopetitive service development environment.

5.3.2 DISCO model

The study of Publication IV introduces a DISCO model to explore the strategic moves of mobile payment service innovators for survival in a coopetitive ecosystem. Figure 5.8 shows the milestones in coopetition of China Telecom in mobile payment in the DISCO model.

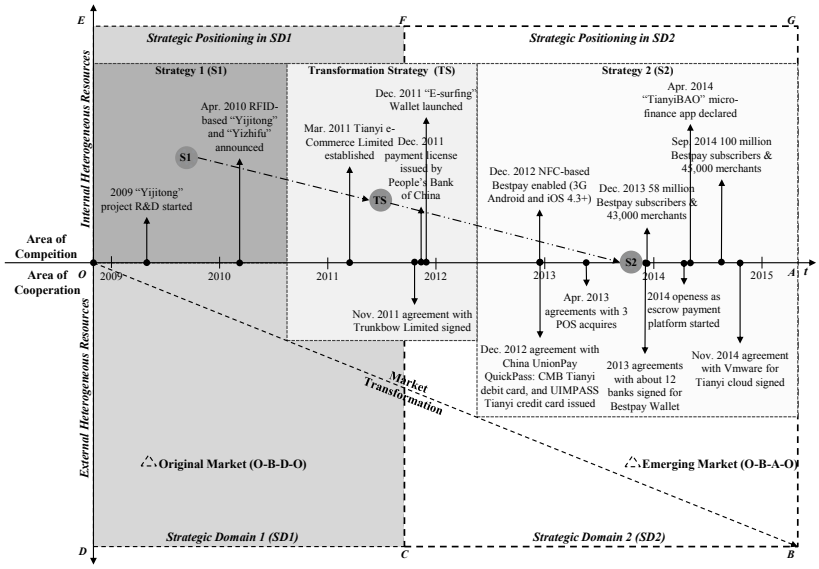

Figure 5.8. Milestones in Coopetition of China Telecom in Mobile Payment in DISCO Model; in Publication IV.

In the figure, the strategic movements of the mobile payment innovator, China Telecom, were pointed out in the DISCO model. In addition, the detailed discussions on the strategic moves of each stage were: the selected strategy 1 (S1) of the self-organizational private innovation by the case firm in the strategic domain 1 (SD1), i.e., the original market within competitive environment; the transformation strategy (TS) of platform-as-a-strategy through multisided platform in line with the market transformation taking place in Chinese mobile payment business surroundings; the adjusted strategy 2 (S2) of the interorganizational collective innovation of the coopetition partnership mechanism in the strategic domain 2 (SD2), i.e., the emerging market within coopetitive environment.

Through the in-depth case study of China Telecom, Publication IV analyzes an initiator's strategic moves and its performance of self-organizing private innovation and interorganizational collective innovation on mobile payment in a coopetitive environment. The findings from the analy-

sis of applying the DISCO model to the case firm indicate that collective innovation has the potential to be a successful strategy for firms' survival in a coopetitive environment through their superior competencies, i.e., S1 to TS to S2 in the Figure 5.8. However, the results show that the firms should pursue new ways in managing the paradoxical relationship with challenges in coopetition, resource allocation, and control.

5.3.3 COIN model

Publication V provides the COIN model (as described in Figure 5.9), along with the Consumer Matrix, the Business Matrix, and the Resource Matrix, for managing coopetition by providers in coopetitive environments. The matrix flow (i.e., Resource Matrix — Business Matrix — Consumer Matrix) is depicted in Figure 5.9 as being a closed loop of Resource — Resource Allocations — Resource Combinations — Business Offerings — Resource. In addition to consumers, the businesses are considered as co-producers of services innovation in coopetition. Usually, these businesses require resources allocations and combinations of participating actors, which are connected to one another in the business networks, for innovating knowledge-intensive viable business services (De Brentani, 1991; Hertog, 2000).

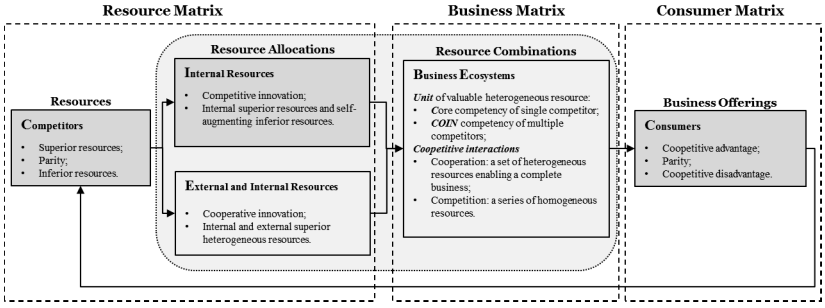

Figure 5.9. A Scheme of the Coopetitive Innovation (COIN) Strategy Analysis Model; in Publication V.

The figure illustrates the dynamic processes inherent in the COIN model. Additionally, it explicitly depicts how firms adjust their innovation strategies as a result of coopetition: competitive innovation or cooperative innovation. The COIN model consists of three breakdown parts: the Consumer Matrix (see Figure 5.10), the Business Matrix (see Figure 5.11) and the Resource Matrix (see Figure 5.12).

The Resource Matrix gives a brief description of the competitors and

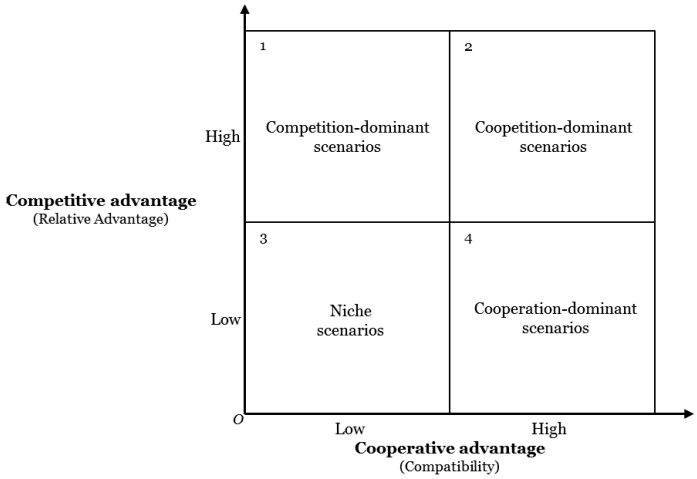

Figure 5.10. Consumer matrix; in Publication V.

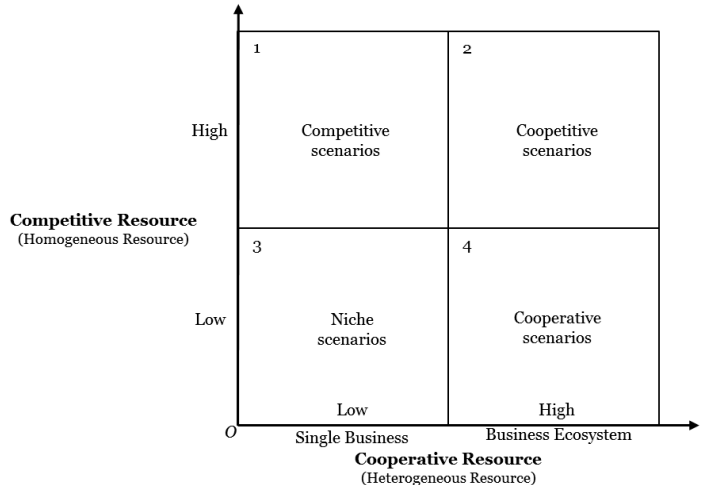

Figure 5.11. Business matrix; in Publication V.

their resource allocations of internal resources and external resources. The Business Matrix pictures the resource combinations of internal and external heterogeneous resources for enabling innovative business offerings within coopetitive business surroundings. The Consumer Matrix illustrates the consumers perceptions of the coopetitive advantage and the coopetitive disadvantage to the business offerings which are provided by the business ecosystems via the recombination of the superior heterogeneous resources.

Publication V compares the COIN strategy analysis across the four cases, in addition to the conceptual framework of COIN model and the break-

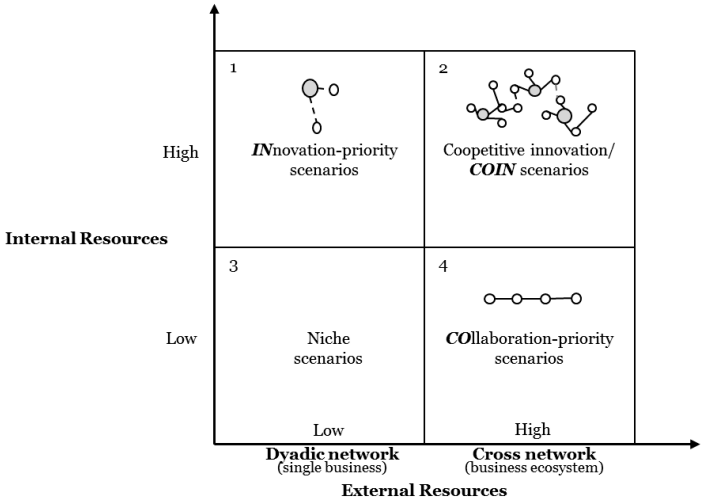

Figure 5.12. Resource matrix; in Publication V.

down matrixes. This research identifies and visualizes the four exemplified cases in Consumer Matrix, Business Matrix, and Resource Matrix. The results of the cases of mobile payment service innovation, i.e., Alipay Wallet, Bestpay Wallet, Elisa Wallet, and Apple Pay for quick scans, show how the mobile payment competitors reflect their innovation strategies in COIN model and the related matrixes.

To summarize, based on the findings from the analysis of several cases, the presented models (i.e., RISE model, DISCO model, and COIN model), as separate and combined, were supposed to reflect whether the competitors' innovation strategies match their business positioning or not, while innovating mobile payment services in a coopetitive environment.

6. Conclusion and Discussion

This chapter concludes the main outcomes of the research work. The concise answers to the research questions are provided in Section 6.1. The theoretical and managerial implications are introduced in Section 6.2. The limitations and the future directions of the research are presented in Section 6.3.

6.1 Answers to the research questions

The overall research question of this dissertation is formulated as *How do firms manage coopetition while innovating mobile payment services?* (see Chapter 3).

Mobile payment is an important and central element in digital ecosystems. Coopetition has become an unsolved issue in the digital ecosystems while firms innovate in the sustainable services. In order to solve this problem, this dissertation answers the research question as following steps.

First, this dissertation investigates and characterizes the mobile payment service innovations in different environments, especially in the Finnish and Chinese market. A morphological box of mobile payment characteristics and instances was introduced in Publication I. In addition, this dissertation compares 10 cases of mobile payment service innovations released by Finnish and Chinese initiator providers. The findings from the industrial background and the comparison of cases within the morphological box indicate that the issue of managing coopetition becomes an essential but challenging task for firms' survival in mobile payment business ecosystems.

Second, as discussed in Chapter 3, the overall research question is divided into two sub-questions:

RQ1: How does a company select and adjust its strategy for sustainable service innovation in a coopetitive ecosystem?

RQ2: What is the role of consumer adoption for mobile payment service innovation in coopetitive environment?

The following provides concise answers to the sub-questions. This dissertation answers the first sub-question in Publication I, Publication III, Publication IV, and Publication V. A set of models were proposed and developed in this dissertation for managing coopetition by firms while innovating mobile payment services, as well as applying the models in the studies of the case companies. Publication III introduces the RISE model service innovation in coopetitive business environments. The RISE model can be used to illustrate why and how firms take advantage of platforms and ecosystems for innovative mobile payment services development to achieve coopetitive advantages based on firms' superior resources. This dissertation investigates three representative cases in a coopetitive market. The firms take their activities and interactions of service innovation in two types of patterns: self-organizational private innovation and interorganizational co-innovation. According to the patterns of the innovation strategies, the firms reorganize their superior and inferior resources and capabilities within or without the ecosystems established by them (see Figure 5.7; Publication III).

In order to investigate and understand the strategic moves by firms while adjusting their innovation strategy, this dissertation provides the DISCO model for analyzing the dynamics of innovating strategic moves in coopetitive business environments (Publication IV). This dissertation presents an in-depth case study of a provider to illustrate how a firm adjusts its innovation strategy with a series of strategic moves from original market, i.e., strategic domain 1 (SD1; competitive environment), to emerging market, i.e., strategic domain 2 (SD2; coopetitive environment). The findings from the case study show that the firm may take transformation strategy (TS; platform-as-a-strategy) as a transition from strategy 1 (S1; self-organizational private innovation) to strategy 2 (S2; interorganizational collective innovation) (see Figure 5.8; Publication IV).

The findings from the analysis (Publication IV) of each stage of the strategic moves show a series of paradoxical relationships with challenges in coopetition, resource allocation, and control. Therefore, this dissertation provides the COIN model for solving the problem caused by the chal-

lenges in coopetition, resource allocation, and control (Publication V).

As discussed in Chapter 5, this dissertation presents a scheme of the coopetitive innovation strategy analysis model, namely the COIN model. The COIN model, along with the Consumer Matrix, the Business Matrix, and the Resource Matrix — as separate and combined — can be used for firms managing coopetition while innovating mobile payment services (Publication V). The Consumer Matrix shows the consumers' perceptions of the competitive advantage and the cooperative advantage to the business offerings. The Business Matrix illustrates the resource combinations of resources within coopetitive business ecosystems. The Resource Matrix describes the competitors forming their business ecosystems via the reallocation and recombination of the superior heterogeneous resources in the coopetitive business surroundings. In addition, Publication V uses four cases of mobile payment service innovation (i.e., Alipay Wallet, Bestpay Wallet, Elisa Wallet, and Apple Pay) to apply the COIN model and the breakdown matrixes. The case analysis shows how the mobile payment competitors reflect their innovation strategies in COIN model and the related matrixes.

Overall, the research and the models — the RISE model, the DISCO model, and the COIN model — presented in this dissertation are supposed to help in analyzing firms' innovation strategies while innovating mobile payment services for managing coopetition.

The secondary sub-question is answered in Publication II and Publication V. In addition to the quantitative study of Publication II, this dissertation develops the Consumer Matrix and the Business Matrix in COIN model for reflecting the consumers' behavioral intention and the consumers' outcome of business offerings competing with the alternatives in a complex business environment (Publication V). Consumers play a key role in fueling the growth of the demands to the businesses that are facilitated by mobile payments. In addition, the mobile payment innovative services must be accepted by consumers based on their perceptions of the outcomes of the service offerings competing with the alternative ones. The key influential factors of consumers' adoption in coopetitive environment for mobile payment service innovations consist of the competitive advantage factor, i.e., relative advantage, and the cooperative advantage factor, i.e., compatibility (see determining factors in Publication II and the Consumer Matrix in Publication V).

6.2 Implications

This dissertation has a number of theoretical and practical contributions to the field in terms of the analysis of coopetitive service innovation in digital ecosystems, especially in mobile payment ecosystems. The detailed contributions of each publication included in this dissertation are listed in Chapter 1.

In addition to the contribution in understanding the role of consumer adoption for mobile payment service innovation in a coopetitive digital ecosystem (Dahlberg, 2015; de Reuver et al., 2014), the presented models enable executives and designers of the firms in a coopetitive business environment to identify how coopetition impacts their strategy (Ghazawneh and Henfridsson, 2011; Gnyawali and Park, 2011; Sambamurthy et al., 2003; Zhong and Nieminen, 2015), to realize the dynamics of coopetitive interactions between actors (Gnyawali and Park, 2011; Ritala et al., 2009), as well as to be aware of the nature of coopetition in service innovation (Dagnino and Padula, 2002; Gilson et al., 2009; Helmers and Rogers, 2010; Polder et al., 2010; Zhong and Nieminen, 2015) and the balancing of cooperation and competition (Bengtsson and Kock, 2014).

6.3 Limitations and future work

This dissertation has a few limitations. These limitations could be addressed in future studies.

First, the present research as a whole is based on several years of investigations in the Finnish and Chinese market. Hence, it should be considered when generalizing the findings in other markets.

Second, the research develops a set of models based on an in-depth case study and several cross-case studies. The main limitation of the case study relates to its focus on each selected case. The characteristics of the case company certainly bring in bias to the findings. According to the characteristics of the case firm, the findings from the in-depth case study may be more applicable in a situation where a company wants to defend its well-established market position. Moreover, this dissertation has focused on the positive effects of interorganizational co-innovation. Inevitably, there are downsides too, which need to be analyzed in future research.

Third, this dissertation is unable to investigate international collective

innovation, though the coopetition in mobile payment domain is becoming increasingly international.

Fourth, despite the efforts in including and defining the consumer viewpoint in a solid way in this dissertation, there is still room for further modeling to understand the role of the end-user in the business chain. Careful user-originating analysis might reveal even more innovative paths for mobile payment service design and development in the future. The Consumer Matrix in the COIN model provides a place for future direction.

Apart from that, understanding the economic theories, e.g., competitive equilibrium and cooperative equilibrium, would be helpful for those studies.

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